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FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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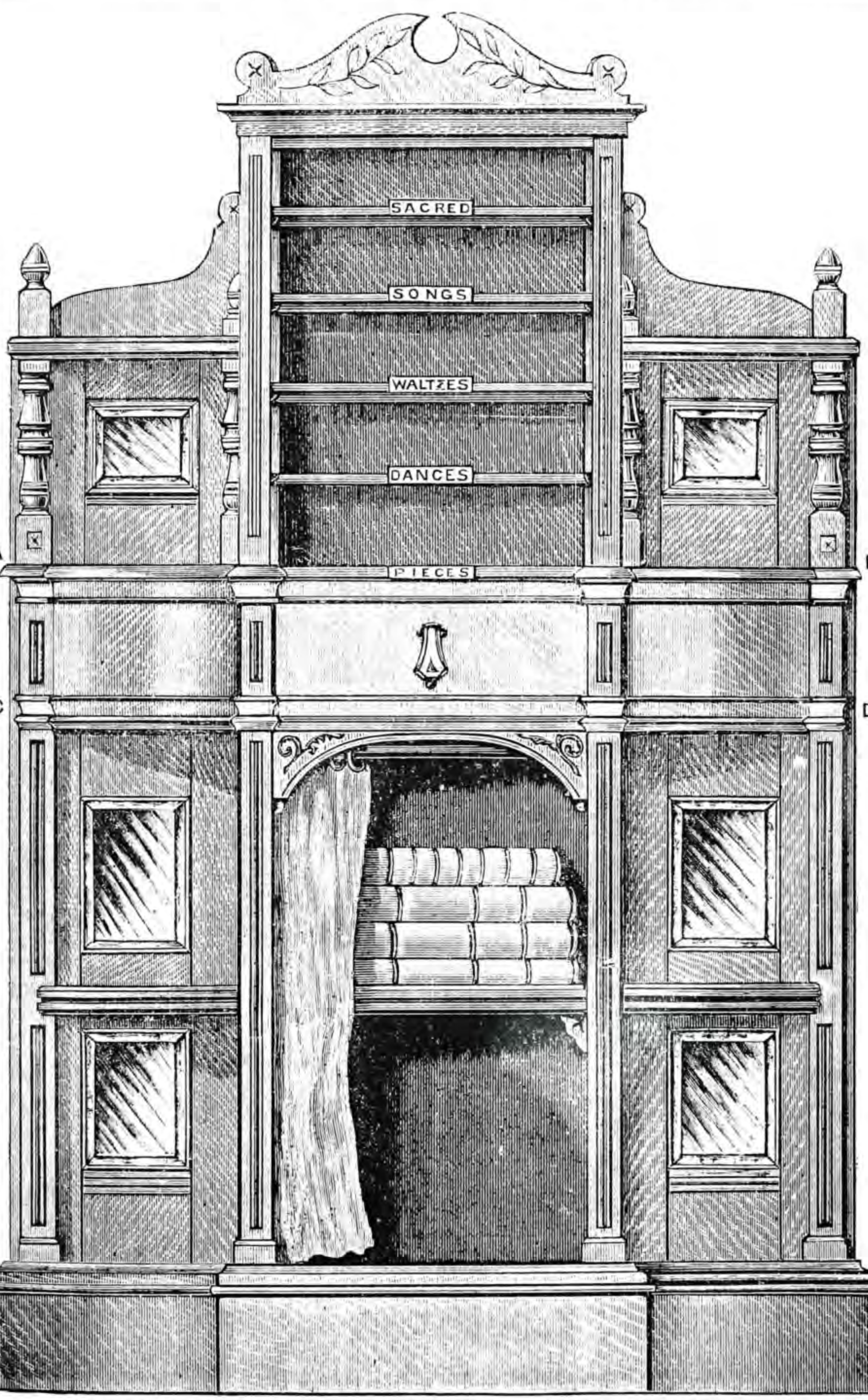

Fig. 1.—Music Cabinet in Queen Anne style with Wings: Front Elevation.

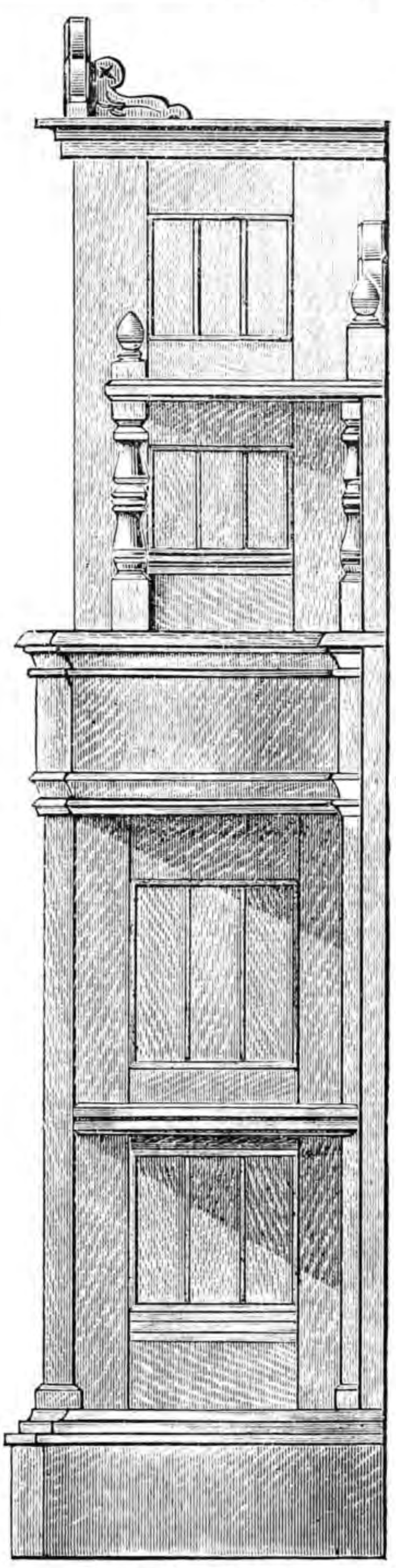

Fig. 2.—Side Elevation.

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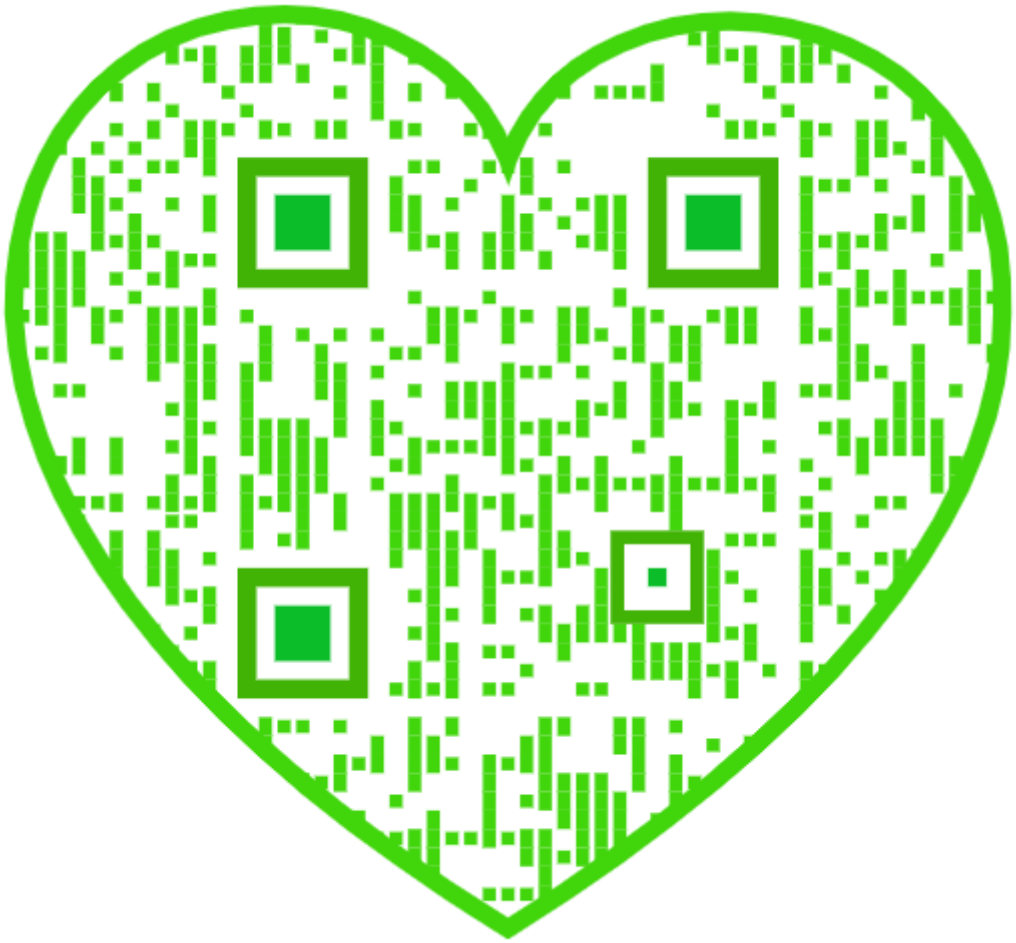

A MUSIC CABINET IN QUEEN ANNE STYLE.

AN ALTERNATIVE METHOD AND DESIGN.

BY JOHN W. HARLAND.

In continuation of my subject commenced in No. 39, I now give a design in the Queen Anne style, as more suitable for modern drawing rooms than the semi-Gothic, but simpler, cabinet shown and described in No. 39, which, as I then said, was more suitable to the school room and morning room than to the more expensively decorated rooms devoted to the reception of and entertainment of guests.

A reference to the drawings and a comparison with the first design, even if cursory, will show that, supplementing the same usefulness and the same actual proportions, a pair of wings are added for the display of the inevitable "bric-à-brac," the English translation of which, curiously enough, is found in the rhyming word "knick-nack," although derived as they are from distinct and wide-apart seats of language.

The height and narrowness of the former design are here dissipated by the means I have employed to give breadth and importance to the cabinet as a decorative piece of furniture, whilst its cost, so far as labour only goes, is augmented, the extra quantity of material being almost nominal.

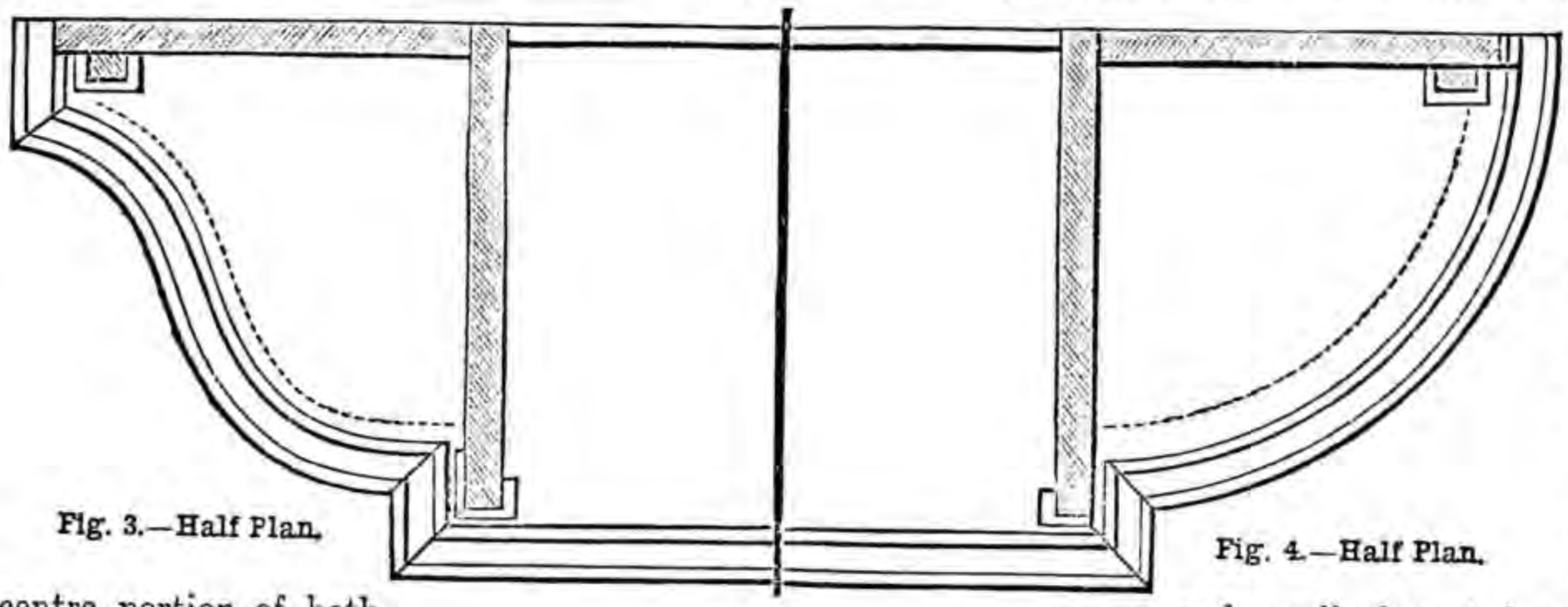

Fig. 3.—Half Plan.

Fig. 4.—Half Plan.

Preserving the previous dimensions and the same construction, which is the strongest possible so far, the centre portion of both cabinet and pedestal, and also of the drawer and lower plinth, I must first show how the new design can be made so as to lift off the upper part from the lower, for convenience in removing it from one place to another—a great desideratum in London. This can either be done at A, B, B, or at C, D, D (see drawings), according to individual choice; the latter is my own preference, and the following construction will refer to this mode; any change therefrom will have to be modified somewhat by the individual carrying it out. Let us premise that our drawings are $\frac{1}{8}$th full size, *i.e.*, $1\frac{1}{2}$ in. equal 1 foot, and that the first step in the attempt to make it is to enlarge these scale drawings to full size, either on paper or upon a working drawing board.

Here note that, for the sake of symmetry, any article of furniture brought into juxtaposition with a pianoforte, organ, or even the ordinary furniture of a drawing room, should reproduce proportionately the relative heights of other furniture in the sub-division as to stages. The keyboard of a piano, organ, or harmonium, the mantel-shelf or board, the brackets round the walls, or any other principal projections, should have some ratio to one another, or there will be a distinct, though perhaps an unconscious, impression conveyed of incongruity, scarcely accounted for, but undoubtedly present. This has governed us in the height of the top of our pedestal and the commencement of the superimposed cabinet, both in the present and in the former design. Hence, if placed side by side it will be seen that the levels A, B, B, and C, D, D, are the same identically in both.

Having framed together the two pairs of frames, with their panels made as shown, which constitute the sides of the centre portion of the design, in the same way as those described in my last—so far as the remarks then made can be adapted to the present design—proceed to frame a winged entablature with drawer in centre as shown, made to carry the wing-style next to be described.

On the extreme left and right of the back of the cabinet to support the ends of the entablature, to receive the ends of the plinth, and to carry the shelf for "bric-à-brac" above the entablature, at the same time affording a style for the panelling of the back boards of the wings, should be a corner post, $1\frac{1}{2}$ in. by $1\frac{1}{2}$ in., sawn into two at the level of D (so as to part there in lifting off the upper portion), but fitted with a dowel, to maintain its position, one end of which dowel should fit into a hole to correspond, but not of course glued, except where it is fitted into the lower part of this corner post, which should descend to the floor, and carry the end of the plinth, which should die into it, being tenoned and wedged into a mortise cut for its reception. These corner posts should be ploughed

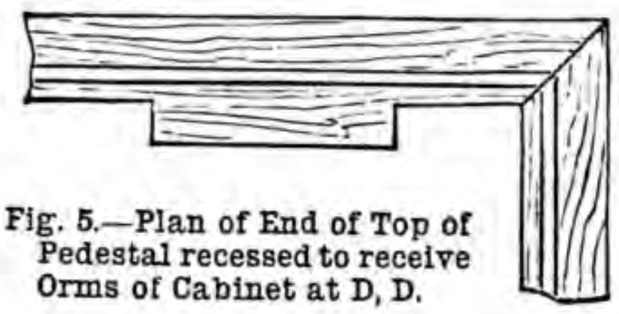

Fig. 5.—Plan of End of Top of Pedestal recessed to receive Orms of Cabinet at D, D.

$\frac{1}{4}$ in. wide and $\frac{1}{4}$ in. deep on their interior sides, to receive the back panel frames, a similar and opposite groove being ploughed into the back styles of the bottom of cabinet proper, and the semi-table tops of the two wings must be made. This will consist of a rail the whole width of the back 6 in. deep, as shown, into which are mortised the two sub-plinths that form the sides of the receptacle for the drawer, and the curved wing rails also mortised into it at its extremities at one of their ends, their other ends being tenoned into mortises in the front ends of the drawer-rails or sub-plinths of the entablature, all these being of equal depth, viz.: 6 in. Similarly the plinth or base should be framed together, but instead of making this frame so deep as the former, it will suffice to make it 1 in. thick, left large enough to work it into the fillet and bead moulding shown in the drawings, the plinth itself fitting underneath it, and secured to the orms of the pedestal side frames, as before described (see WORK, No. 39), in front and mitred and returned round them, again mitred inversely, and taking the curve of the entablature above, though larger than it, by the projection beyond it as shown in the drawings, the ends of this curved plinth will die into and be secured to the cabinet and pedestal side frames, to berth the other sides of the back panel-frames both above and below the entablature back rail. These back panels are shown in the drawings as bevelled glass in a frame of wood with a fancy beading to keep the glass in place; the glass may be either a mirror, a plain crystal, showing the wall through it, or backed by panels, faced with water-colour drawings with cut through mounts, with photographs, plaques, or other decorative designs; or instead of glass, china hand-painted plaques, or even wood panels, carved or plain, may be used as variations in all, or any of them. The curved rails of the entablature, and, of course, the under and upper shelves, may be either quadrants of circles or O G in form, according to which alternative half plan be chosen, as shown in Figs. 3 and 4. The table tops of both base and entablature should project as shown beyond the plinths in one case, and the entablature rails in the other, to be worked into one of the members of the mouldings, of which they form part, which should be mitred and returned round the square projections as shown, and the neck-beadings likewise. The top of the cabinet at front and the top of each wing at back should be finished as shown with shaped rails, whilst the sides of centre-piece should finish with a rail, worked into a rather large bead on upper edge. The fronts of the corner posts and the fronts of the cabinet and pedestal styles should be fluted and stopped as drawn, to match each other, and small elongated panels carved in them where they traverse the entablature, above which the two corner posts may be turned with squares left on, rounded at their tops and finished with turned knobs or "acorns," a third piece being turned to match, cut halves, and planted each on each side-style of cabinet to carry shelf and correspond with the corner posts. The front edges of the styles being 1 in. thick only, should be thicknessed out by planting on them, outside, $\frac{1}{2}$ in. by $1\frac{1}{2}$ in. strips forming the return of the pilasters below the entablature and above it, to take the half of the turned counterpart of the corner posts.

A curved rail, as shown at top of pedestal, forming an arch, conceals partially the curtain rod, which drops into its place at ends in notches cut for it, before the top is put in place, which when in place keeps the rod from rising. At each end of book-shelf in pedestal is a small corner bracket shaped to form shown. The drawer is fitted with a brass or plated drop handle, with or without a keyhole and lock.

The cabinet contains trays of millboard covered with cloth or leather, with flaps as described before or wooden trays as shown with tablets for the different classes of music. In the design, both above and below the cabinet is left open; it may, however, be fitted top and bottom by single or double glass-panelled doors; if so, the side frames of both should be made $\frac{3}{4}$ in. wider for these to shut into; the top rail of the lower door or doors should be arched so as to carry out the idea of the design.

In this cabinet, as well as the former drawing, instead of a tray in the division

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just above the drawer a space is left without a tray, but if preferred, one may be introduced.

I should have mentioned in my former paper that various portions shown in drawings may be ebonised, the rest being mahogany, walnut, or other wood polished, the ebonised parts being of best pine or of American whitewood for cheapness. In like manner, these parts might be enamelled white, pale pink, or other tint picked out with gilding, the other parts being treated similarly, but paler, if tinted, than the rest, in which case all the wood used might be whitewood or pine, which again might be used for construction and veneered, and inlaid even if wished.

Again, if required, a drawer might be fitted in the front of the base plinth for MSS., music, etc.

Such cabinets as these would contain when full about 75 pieces in each tray, or 375 in all, besides a dozen or more volumes of bound music, and a quantity of MSS. and odd-sized sheets in the drawer; would keep it in good order, and ensure any one or more pieces being instantly found.

PLAIN AND DECORATIVE HOUSE PAINTING.

BY A LONDON DECORATOR.

OILS, VARNISHES, AND OTHER VEHICLES; SOLID AND LIQUID "DRIERS."

HERETOFORE we have considered the solids and pigments most useful to the house painter; we will now briefly occupy ourselves with oils and other fluids which, compounded with those pigments, are indispensable to the worker in mixing paint.

Oils are usually divided into two classes, and are termed *fixed oils* and *volatile oils*. Fixed oils are further distinguished, by their nature and source, into *fat oils* and *drying oils*. Fat oils are those which contain an excess of oleic acid, or stearine, as the animal and fish oils, and these are consequently non-drying oils. Drying oils are those which harden into a solid form, as, for instance, linseed, poppy, and nut oils.

With the first only of these latter—linseed—need we here concern ourselves. Its source and appearance are matters familiar to all of us; but its qualities and properties, from the painter's point of view, is a matter it is necessary to dwell upon. Drying oils and linseed oil particularly, amongst that class, owe this characteristic of "drying" to their excess of resinous properties, and therefore, when used under the influence of oxygen, they dry or harden into a horny substance or film.

Good and reliable fluids, it will readily be understood, are as necessary in the mixing of paint as are good pigments. Linseed oil occupies a premier position amongst its kind, similarly as genuine white lead takes that place amongst the solids; and further than this, just as white lead forms the basis in nearly all light colour paints, so "linseed" is the principal solvent in the preparation of varnishes and other vehicles.

The few imperfections common to good linseed oil are such as do not materially affect the work of the house painter. Least of any, amongst all the articles used in the trade, should it be tampered with; the addition of fish oils especially, with which and rape it may occasionally be adulterated, being inimical to its drying quality and durability. It should always be transparent, free from any rancid smell or taste, and of a light yellow or amber colour.

With a well-stocked market of linseed to supply our wants at a very reasonable price, we have little occasion for using any of the other expressed oils; *boiled oil*—viz., boiled linseed oil—is, however, a very serviceable preparation we must notice.

As its name implies, boiled oil is the ultimate product of the raw linseed boiled with *litharge*—oxide of lead—or some similar article. By this process the oxidising or drying qualities of the litharge are communicated to the oil, which latter furthermore gains body and brilliancy. Notwithstanding these considerable advantages, the boiling of linseed oil causes it to become much darker, and hence it is seldom used for light colours, and but rarely for interior painting. For preservative work boiled oil is almost indispensable, and especially with dark pigments; its colour is then no disadvantage, whilst its extra body and hardening qualities are a decided gain.

Gilders' Fat Oil is another condition of linseed oil, and is the chief factor used in making gilders' and decorators' *oil gold size*. It may be prepared by keeping raw oil in a closed vessel for a considerable length of time, by which it acquires a special brilliancy and drying quality, when prepared as oil gold size with certain pigments. I have made good fat oil for gilding by keeping the accumulated skins and scrapings of gold size in a clay jar, and covering them with about a quart of best raw oil. After being exposed to the atmosphere, but protected from rain, etc., with occasional stirring, the oil, by the oxidising action of the old size-skins and the exposure to air, has been converted into good fat oil after about a twelvemonth. Doubtless there are more expeditious ways of artificially preparing it, but the above gives a fairly quick and reliable result.

Oil of Turpentine, commonly, but incorrectly, termed *spirit* of turpentine, ranks next to linseed for the painter's use. It is usually called, by an abbreviation, "turps," and its colourless appearance and strong pungent odour, as well as its inflammable nature, are items doubtless familiar to my readers. Although turpentine contains a slight proportion of resin and other matter which will not evaporate by exposure or heat, and which fact demonstrates the fallacy of calling it a spirit, its volatile nature makes it invaluable to the painter for thinning the drying oils and for making "flatting" paint. Since oil of turpentine contains but a small proportion of the resinous properties common to the expressed oils, it follows that its binding quality is very poor, and paint compounded with turps alone can be rubbed away by friction. Like linseed oil, that of turpentine is largely used in the manufacture of varnishes and other painters' vehicles. The most important of such liquids we will now notice.

Varnishing is the last process of house painting, and consists in covering our pigments and paint with a film of a transparent resinous nature, which not only preserves the paint from the ill effects of the atmosphere and handling, but brings out the colour of the paint to its fullest extent. Where paint is prepared with an excess of raw linseed or boiled oil, varnishing is not necessary, since the oil itself encases and protects the particles of the pigment or solid used, and by its smoothness and body maintains a good gloss. For all better class work, however, and necessarily, for graining and marbling, a protective body of oil varnish is desirable, but experience and knowledge here are necessary to discriminate between the varied kinds that are made.

Varnishes may, for my present purpose, be considered in three classes, as *expressed oil varnishes*, *volatile oil varnishes*, and *spirit varnishes*, and from which nomenclature some notion of the solvents or liquids they are compounded from is gathered. It is customary in the trade to further distinguish them by the substance or resin they contain, such as *copal* varnish and *mastic* varnish, and again to almost absurd extremes by their probable use as *oak* varnish and *maple* varnish.

For whatever purpose varnish is required, it is most unwise for a novice to attempt to prepare it himself. Thirty years ago, when a painter's apprentice was necessarily initiated into the making of boiled oil, japanners' gold size, etc., the price of varnish was so high as to excuse the experiment, but nowadays, when varnish is about half the price it then was, the attempt can only be considered, under ordinary circumstances, as a *dangerous* waste of time and material. Keen competition has now reduced varnish-making to a matter of fair profits, and my sole motive in briefly considering here the articles they are compounded from is for the better and more intelligent use of the varnishes.

That there are to be purchased, otherwise useful, volumes containing receipts for making varnish, I am fully aware, but discretion and experience alike teaches one to look lightly upon them. On the direct authority of one of our largest and most eminent varnish and colour-making firms—Messrs. Mander Bros., of Wolverhampton—I have it that "very little has been written upon the subject," and that the bulk of that little is "trash," and therefore, noticing several queries on the subject in "Shop" recently, I venture to commend this information to those would-be economists.

The best and most serviceable varnishes for use in connection with painting belong to the first of the three classes I have enumerated, namely, *oil varnishes;* and these are further usually known by the term "copal"—the name given to the gum principally used in their manufacture. This substance, which in appearance somewhat resembles amber, is imported from tropical parts, and is the product of certain trees. When a firm of varnish makers purchase what we may term a "parcel" of gums, it is very carefully assorted into various degrees of lightness and transparency. The whitest variety of the gum is usually the scarcest; and, as it follows that the colour of the copal must exercise a considerable influence over that of the ultimate product, white copal varnish is, consequently, a very expensive preparation.

In the manufacture of copal varnishes, the gum, generally, is first dissolved by heat, and then converted by turpentine into the liquid form, with the addition of linseed oil to give the copal elasticity; the colour of the oil used is, therefore, a further important factor. Colourless varnish, such as that known as *mastic*, can be simply made by dissolving the picked gum in oil of turpentine, but since the absence of linseed oil causes the liquid to set and harden very rapidly, such a preparation would be practically useless for the house painter, besides lacking in that elasticity and body which it is the special property of linseed oil to contribute.

The exigencies of space, etc., and the necessity for respecting these in every way, compel me to reserve the continuation of this part of my subject for another paper.

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TINNING COPPER, BRASS, ETC., AND BRAZING.

BY R. ALEXANDER.

ARTICLES made of copper and brass frequently have to be tinned, sometimes on one side only, sometimes on both sides. In some cases, such as stew-pans, tea-urns, and the like, they are tinned after they are made; but many things are made of sheet copper and brass tinned before working up. To do this proceed as follows:—

The sheets or pieces of the metal to be tinned must first be got clean; sheet copper or brass when procured from the makers or factors is generally fairly clean, and will not want a great deal of labour to get it ready for tinning. First of all, get the sheets flat and even by passing them through rollers, or by means of a mallet on a flat plate of iron, but do not hammer them. They must next be pickled. In shops where there is a lot of tinning done, they have pickling vats and tubs to immerse sheets and articles that require tinning. These are usually of wood or wood lined with lead; but for ordinary work in small shops it is not worth while to go to the expense of these, so proceed as follows. Take a piece of stick or iron rod about 18 in. long, and twist tow or hemp round it to make a kind of mop or swab; tie it to prevent it slipping off. Pour into a dish or basin some raw spirits of salts, and dipping the swab into it, rub the pieces of metal to be tinned on both sides; wash off with water, and well scour with "scale" from the blacksmith's shop, using a piece of sacking or similar material to rub with. When judged sufficiently clean, wash off the dirt, and stand to drain while you get ready for tinning. You will require for this some tin run out in strips like solder, some sal-ammoniac pounded up fine in a mortar, a pair of close tongs to hold the sheet metal whilst on the fire, a tinning rod, and some tow for wiping off. Assuming that a forge is to be used for tinning, a few remarks on the same will not be out of place. A fire for tinning should be in the centre of the hearth, as unless it is, there is not room to manipulate large pieces. If the forge is not so constructed, you must bring the fire out farther by fitting a piece of iron gaspipe (say about 10 in. long) into the tuyere, or tue iron as most workmen call it, though incorrectly, that is, the hole in the cast plate at the back of the forge through which the blast comes. Fig. 1 will show more clearly what I mean. It represents a portable forge; P is the pipe from tuyere to centre of hearth; H, a frame of stout hoop iron 3 in. deep and about 12 in. square, with hole half-way down for pipe to go through; this frame is to keep the fire from being scattered about. The pipe should dip a little towards the fire, so that if any molten tin should get in, it would not run back into the bellows.

Gas can also be made use of for tinning, and it is very clean and handy The home-made gas stove shown in Fig. 9 in the first of these papers (page 257) will answer very well for moderate-sized pieces; and by using a larger two-burner stove of similar pattern, such as Fletcher's No. 14 S (Fig. 2), it will be easy to do any kind of flat tinning. The tinning rod previously mentioned is made by bending a piece of ¼ iron rod to the shape shown in Fig. 3; file it bright before bending, and it will then tin itself whilst being used. This article is to rub the tin on to the surface of the metal to be tinned. To proceed, take the sheet or piece of metal that is to be tinned, and place it on the fire or gas stove; have close by the sal-ammoniac in a jar, so that it is handy to dip out with the end of the tinning rod. Scatter a little on the sheet, and blowing the fire gently (which said fire should be of charcoal), rub on a little tin, commencing at the end of the sheet farthest from you. As the tin flows, rub well with the tinning rod, adding more tin as required, and a little sal-ammoniac now and then. Pushing the sheet away from you as you proceed, and holding it with the tongs when it gets too hot to handle, be careful not to blow too hard or you will burn the tin. You will know when it is burning by seeing the metal turn blue. Should this happen, withdraw it from the fire at once, dash a little sal-ammoniac on it, and rub on some fresh tin, and proceed more carefully. When it is well covered all over, the superfluous tin must then be wiped off. This is done with a handful of tow wrapped up tightly. Commence with the end nearest you, which will be the hottest part of the sheet. Warm it till the tin is well melted, sprinkle a dust of sal-ammoniac on, and commence wiping away from you in straight strokes. Continue drawing the sheet toward you, and heating and wiping till it is all wiped smooth and bright. It should then be scoured with silver sand, dried in sawdust, and polished.

Stew-pans and other kitchen utensils are done in a similar manner, but as they are greasy and the acid or pickle will not act on grease, this must be removed before proceeding further. This is done by placing them on the fire and gently heating them till the grease or fat melts and flares off; the articles must be made well hot, but must not be allowed to get red hot. The scouring process is then the same as just described; this scouring must be thoroughly well done, or it will cause a lot of trouble in tinning. All repairs required should be done before tinning, such as the rivetting of loose handles, shaping, taking out bruises, and so on. As the handles get very hot during the process of tinning, it is usual to use a sheath on the handles of the stew-pans and covers. Fig. 4 shows one of these; they are about 12 or 14 in. long, and made a little tapering so as to slip easily on the handles and wedge tight, leaving 3 or 4 in. beyond the handle, that is, just enough to grasp it by; they are made of sheet iron; 20 gauge will do very well. When the article is well covered with tin, get well hot and rapidly and lightly wipe out with a bunch of tow; should any part get set before it has been wiped, heat it again; the outsides of the articles should be rubbed over before tinning with salt and whiting mixed to a paste with water; this prevents the copper from tarnishing with the action of the fire, and the goods are easier to scour.

A very good way to tin small articles of wrought iron, and which dispenses in a great measure with filing them up bright, is to boil them in "killed" spirits of salts in a pipkin or old iron saucepan; they will, if recently forged and not allowed to get rusty, be ready for tinning in a few minutes; taken straight from this pickle into a bath of tin they will tin at once, or if not, a second dip in the pickle will put them right. This method is of course known to some, but there are many who do not know it. And it is a great saving of time in a jobbing shop, when a few of such things as milk-pail fittings, iron rings, staples, etc., have to be tinned. The articles should be well washed and dried in sawdust, or they will rust. I cannot enlarge further on this subject, as I wish to get on as quickly as possible to the repairing and manufacturing part of this series of articles, but to any question that I can answer I will reply in "Shop."

I will now turn my attention to a few remarks on

BRAZING.

Brazing is somewhat similar to soldering, inasmuch as it is a process by which metals are united by means of heat; it is, however, different to soldering in the fact that the uniting metal or spelter, as it is called, is much harder, and requires a greater degree of heat to melt it than does solder, neither can it be applied with a soldering iron. Brazing is used where greater strength is required than can be given by solder, or when an article has to stand a degree of heat that would cause solder to melt. In brazing, as a great heat is required, it is necessary to have either a forge or a powerful blowpipe; formerly there was only the forge available, and many jobs were thus rendered very difficult, especially in copper or brass, owing to the difficulty of getting a top heat equally efficacious with the bottom. With iron or steel this objection does not apply with such force; I should advise all beginners to experiment a little with iron before trying the softer metals. Let us suppose, for an example, that you have that very ordinary job in a country shop—to lengthen a key, say, for a large plate lock commonly known as a stock lock. We will suppose that you have an old key of similar size of stem and bow; cut your key that has to be lengthened (say 1 in.) at A, Fig. 5; cut your old key bow 1¼ in. longer than the bow you cut off, and if cut off with a chisel, file the ends true, but a hack saw is the proper thing to cut with. The next thing is to dovetail the two pieces together. Fig. 6 shows how this is done, and no explanation is needed; it is done with a warding file, and the edges must be kept square and true; a small ½ round file will assist in this. Test the fitting as you go, and when they fit fairly tight give a light rap or two on the side of the inner piece, that will, as it were, rivet them; the beginner will not get a good fit the first time, but he will get one thing—that is a lot of experience how to go on next time. Fig. 6 A shows the key fitted ready for brazing. Now twist round the joint about seven or eight turns of brass binding wire; this acts equally as well as spelter, in fact, in this case better, as it cannot drop off. Now powder up a little borax, wet the key at the joint, and sprinkle a little of the borax on it. Now blow a fire either of charcoal or small coke, or cinders of coal, either will do; charcoal is a good fuel, but expensive to use; the others will do equally as well; in fact, nine workmen out of ten first blow up their ordinary fire with smiths' coal; in this case, however, it must be blown perfectly clear, or the smoke will get in the joint and spoil it. A little tool called a spatula is very useful and necessary in jobs of brazing to add a little spelter or borax to the melting spelter, to rub off surplus metal, and to rub it into the joints as it flows. It is illustrated at Fig. 7; it is made of ¼ round rod flattened one end to the shape shown, with an eye at the other end; two or three of them in different lengths from 12 to 20 in. will be handy. Now to braze the key. Hold it by the bit with a pair of tongs, and placing it on a clear part of the fire commence to blow steadily; the borax will swell and rise up; you can press it down gently with the spatula; dip the spatula in cold water each time you lay it on the hot metal, or the borax, etc., will cling to it and be dragged off. When you see the wire or spelter begin to run,

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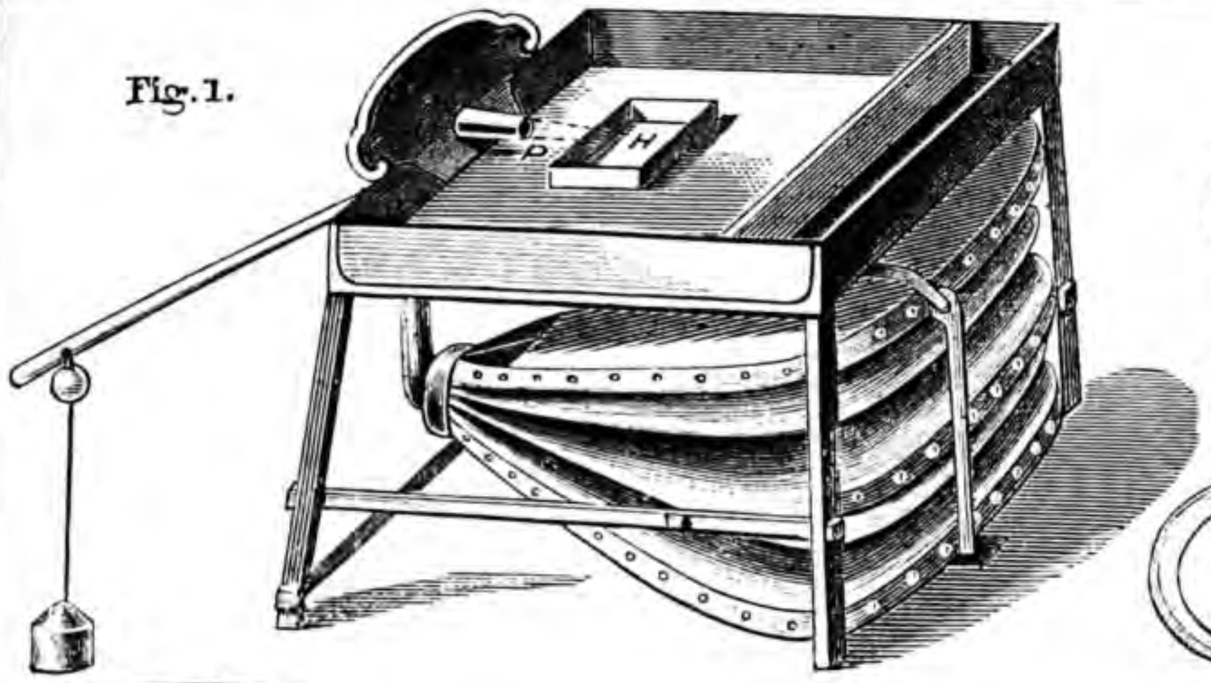
Fig. 1.



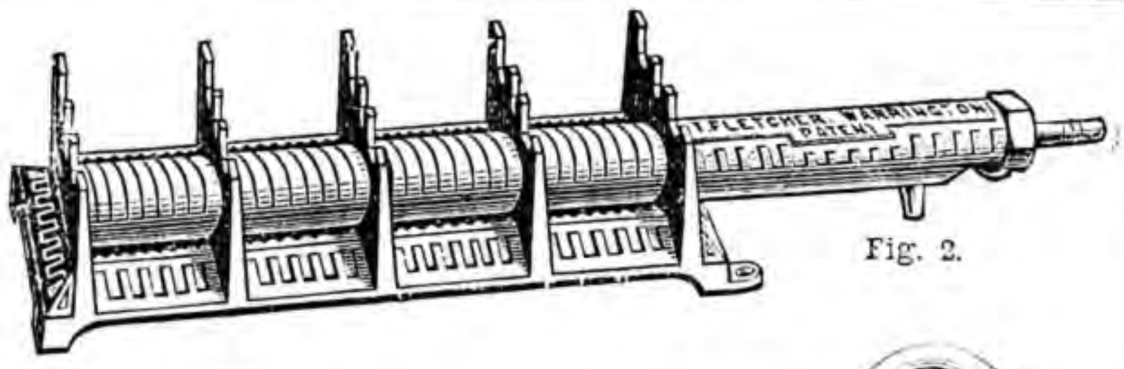
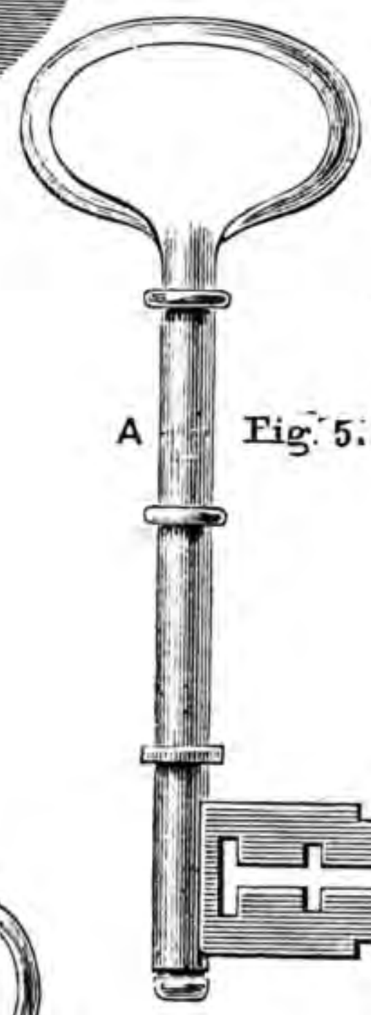


Fig. 2.



A Fig. 5.

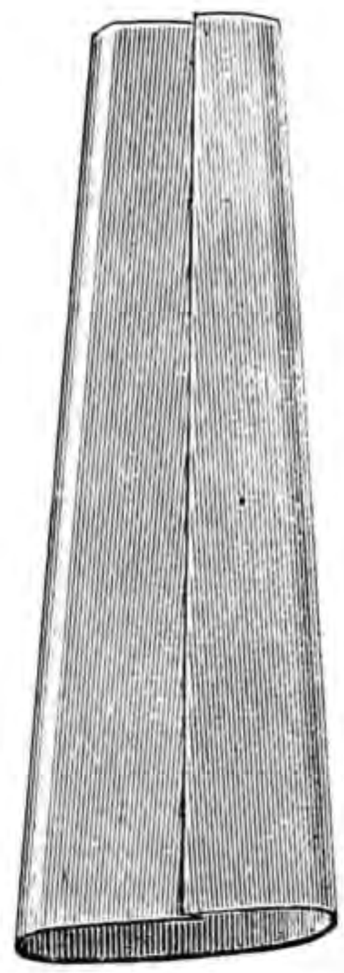


Fig. 4.

Fig. 3.

Fig. 6A.

Fig. 6.

Fig. 7.

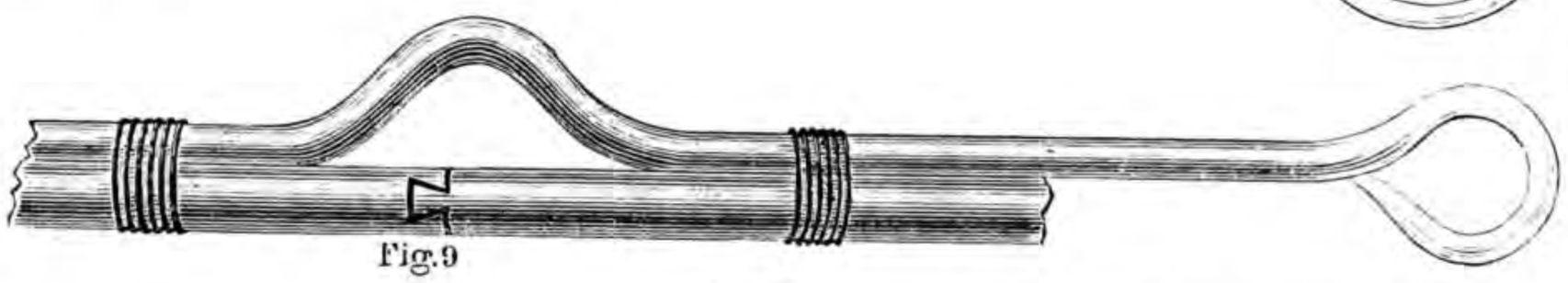


Fig. 9

Fig. 10.

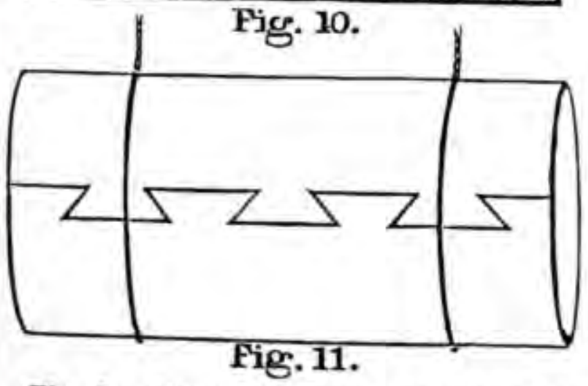


Fig. 11.

Fig. 13.

Fig. 8.

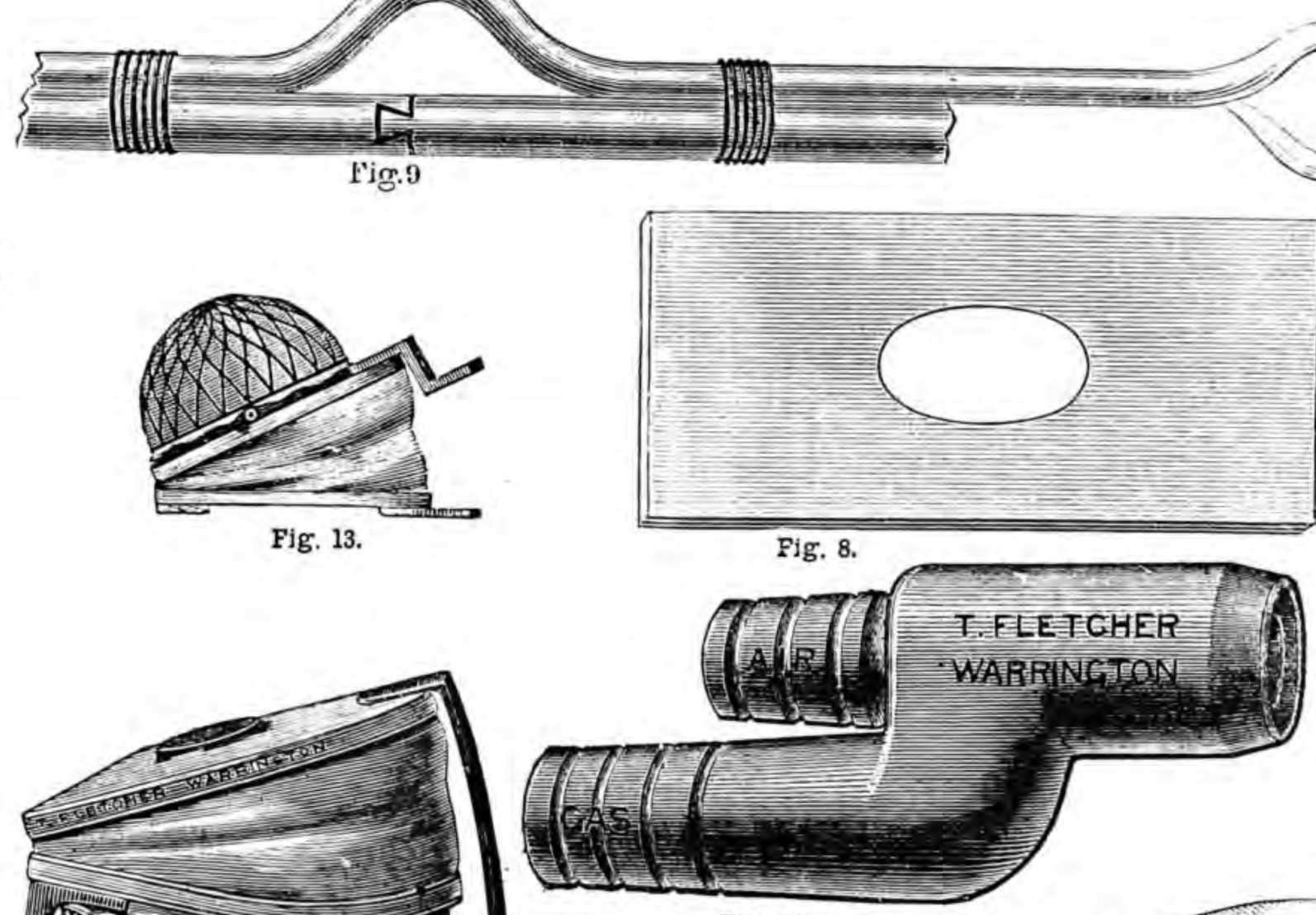


Fig. 15.

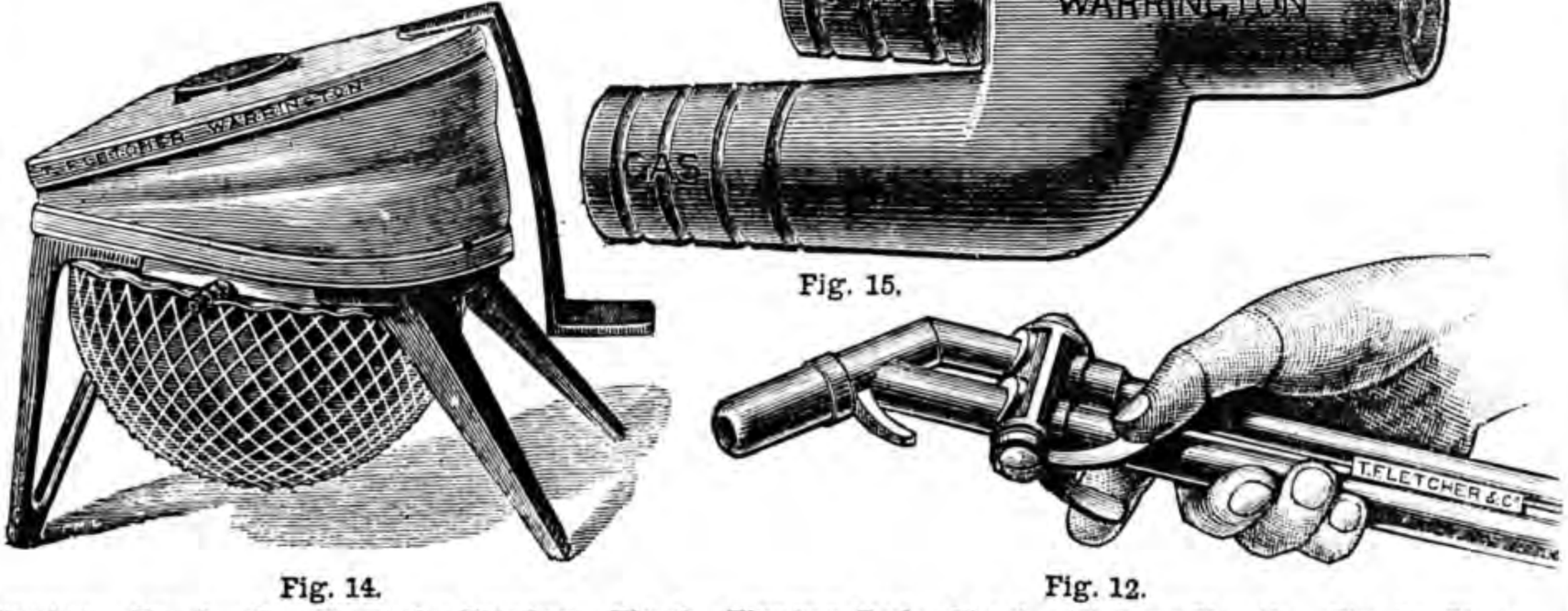


Fig. 14.

Fig. 12.

Fig. 1.—Portable Forge arranged for Tinning. Fig. 2.—Gas Stove for Tinning. Fig. 3.—Tinning Rod. Fig. 4.—Tinning Sheath. Fig. 5.—Plate Lock Key. Fig. 6.—Ditto, showing Dovetails. Fig. 6 A.—Ditto, prepared for Brazing. Fig. 7.—Spatula. Fig. 8.—Protection Plate. Fig. 9.—Mode of holding Two Pieces of Rod whilst Brazing. Fig. 10.—Piece of Copper Pipe cut out. Fig. 11.—Ditto, Tinned and prepared for Brazing. Fig. 12.—Automatic Blowpipe. Fig. 13.—Foot Blower. Fig. 14.—Larger Foot Blower. Fig. 15.—Fletcher's Injector Blowpipe.

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sprinkle a little more powdered borax to help it flow, and when you see it all nicely running withdraw the key gently from the fire, rub off superfluous metal from the key (a little generally gathers underneath), and allow it to cool of itself; never cool a brazed joint suddenly, as the sudden contraction of metal is apt to injure the joint, though I know many who always dip a copper braze in the water directly it is taken off the fire. The key must now be filed up and cleaned so as to scarcely show, except by a thin mark of brass in the joint, where it has been joined. To lessen the trouble of cleaning a key or anything bright of a similar kind that has to be brazed, a guard (Fig. 8) is very useful.

It consists of a piece of stout plate iron about $1\frac{1}{16}$ in. thick, and of sufficient width and length to protect the article laid on it from the direct heat of the fire. A hole is cut in it about $1\frac{1}{2}$ in. long by 1 in. wide, and the key placed on the sheet iron in such a way that the joint comes over the hole as shown in the sketch. You can then blow away without fear of injuring the article by the fire. Some articles also require supporting and fixing, so that the joint will not shift while it is being brazed. Fig. 9 shows a way of holding a straight piece of rod or similar job. Many jobs will require a pin or rivet put through them as an additional security. Always get everything to fit as well as possible; it cannot be too good a fit; the spelter is sure to find its way in if the joint is clean.

How to braze a piece of copper pipe:—

Suppose for a trial job a piece of pipe 12 in. long and 4 in. diameter. Cut your stuff 12 by 13, thin down the edges, A A (Fig. 10), with a crosspane hammer about $\frac{3}{8}$ of an inch clear each side. Notch one side, as shown in sketch, turn it round, bend up the notched pieces X, and slip the other edge in as far as possible, and then knock the notches down and hammer together on a bick iron. Bind round at each end with iron wire as at Fig. 11. It is now ready for brazing. Mix equal parts of spelter and borax in a jar or tray with water, and with the spatula spread it on the joint (inside of course). Place on the fire and blow gently. Sprinkle a little powdered borax along the seam, and as the spelter melts rub along with the spatula, drawing out superfluous metal and putting more in if there should not happen to be enough at first. Be careful not to blow too fiercely, as copper will not stand near the heat that iron will, and brass less heat even than copper. It is sometimes very awkward to braze some articles with a forge, owing to the difficulty of directing the heat to the right place. But there is no need to despair of brazing the most difficult jobs, now that appliances for brazing by means of gas, etc., have been brought to such perfection, especially by Messrs. Fletcher & Co., of Warrington, and this article would not be complete if I did not mention some of them, as they are valuable alike to the professional workman and the amateur. Fig. 12 shows what they term their new automatic blowpipe, pattern C. It is a very simple and very efficient blowpipe for ordinary use. The medium size is C 40 for key brazing, small copper gaspipe, etc., and odd jobs not requiring much power. Where it is possible to do so, small articles should be placed on a piece of charcoal or pumice stone whilst brazing with the blowpipe, or carbon blocks made especially for the purpose by Messrs. Fletcher, in various sizes and shapes. These substances are used because they are fire-resisting, and do not rob the article of the heat imparted to it by the flame of the blowpipe. C 80 is a large blowpipe, same pattern; this will braze $\frac{1}{2}$-in. thick flanges on $1\frac{1}{2}$-in. wrought iron pipe and copper work up to about 2lb to the square foot. These blowpipes require a greater pressure of air than can be given by the mouth, so a means must be found of giving a supply of air under pressure, either by connecting them to a smith's bellows or using a foot blower (Fig. 13). The reason is that it is the pressure of air that rules the temperature of the flame, and, consequently, the power or heat thereby obtained. Thus, to get a sharp, concentrated heat, an air pressure of from 1 to $1\frac{1}{2}$ lbs. on the square inch is required. These blowers will give this with a steady pressure. The small sizes 3 and 5 (Fig. 13) can be worked by the foot or under the arm. Fig. 14, known as 9B, 3, and 5, are for foot use only, and are generally recommended for all purposes.

The same firm also supply very powerful blowpipes for heavy brazing, such as repairing copper pipes without removing, repairs to machinery, etc. No. 1, Fig. 15, requires a smith's bellows or a fan and $1\frac{1}{2}$-in. gas supply. It will burn up to 300 cubic feet of gas per hour, and will heat a 3-in. wrought iron pipe up to brazing heat in a few minutes. No. 2 is a similar blowpipe, but can be used with the foot blower, thus enabling it to be taken and used in positions where to use an ordinary smith's bellows would be a matter of difficulty. There are other useful blowpipes, but space will not allow me to describe them here, and I wish to get on as quickly as possible to the repairing and manufacture of tin goods, etc. My next article will illustrate and describe some further repairs, and the tools and material used for the same.

MEANS, MODES, AND METHODS.

Luminous Paint.

This is so recent an invention that it has not yet been taken into the category of applied science. It is as yet only a novelty; like the old phosphoric writing, visible in the dark, was a half a century ago. The Paris Exhibition has brought into prominence a variety of new ideas and useful inventions, which but for that display with fifty-three thousand exhibitors with a hundred times that number of varied exhibits might have been lurking unnoticed by the world in rooms and workshops; luminous paints amongst the number. Here it had a prominence, its display makes at once easy and manifest. Thousands of square cards were given away, showing the luminous paint on one side. They were thus in the hands of each recipient to test, and they fully established its title to luminosity in the dark so vivid that, by writing any word in Roman letters one-eighth of an inch thick on it, the word was visible. Dipping the card in water, so far from affecting the action of the paint injuriously, made it brighter; exposure to daylight does not deteriorate it.

Now for its practical value. If it is found to be enduring, the names of thoroughfares might be painted with it, and finger-posts at cross-roads, so useless to the benighted traveller who has to take out the lamp of his trap and throw its rays on to the direction; for stairways, and passages, and corridors; on walls of dark offices to add more light, to save the sight of the plodders of the pen. Its uses have to be found out by practical trials and more general knowledge of how it is best applied. It has already won sixteen medals of merit. W. C. Horne, 6, Dowgate Hill, London, E.C., is agent for it.—J. C. K.

To darken Common Mahogany to represent Old Spanish.

To 1 oz. of bichromate of potash dissolved in 1 pint of boiling water. Apply with a brush and allow to turn colour by action of the air.—H. T. N.

Brown Hard Spirit Varnish.

To 1 pint of spirits of wine (meth.), $2\frac{1}{2}$ ozs. best orange shellac, 1 oz. gum benzoin, $\frac{1}{2}$ oz. gum thust, $\frac{1}{4}$ oz. powdered resin, and size of a marble of gum sandarach.

Mode.—Let macerate for two days in a warm place, shaking often and strain.

Note.—Work should be warm but not hot to ensure a good polish with spirit varnish.—H. T. N.

Polish Reviver.

To $\frac{1}{2}$ pint cold-drawn linseed oil, $\frac{1}{2}$ pint spirits of wine (meth.), $\frac{1}{4}$ pint good vinegar, and 2 pennyworth of butter of antimony.

Mode.—Mix the above and well shake. Should be used with a soft cloth, well rubbed in, and not a great deal used at the time; continue for one or two days, when a good polish will be obtained.—H. T. N.

Walnut Stain.

To 2 ozs. Vandyke brown, 2 ozs. American potash, 1 oz. bichromate of potash, size of walnut of soda, size of walnut of sulphate of copper, size of marble sulphate of iron, 2 ozs. nitric acid, and 1 gallon of water.

Mode.—Boil the water, brown, bichromate, soda, and sulphates until melted and well mixed. Then add the American potash, which must be melted first in a little water, otherwise it will effervesce over the sides of the pot. When lukewarm add the acid.—H. T. N.

Dark Oak Stain

To 4 ozs. American potash, 4 ozs. Vandyke brown.

Mode.—Proceed as above with the potash, using 1 gallon of water.

The above are well tried, practical receipts, which I have used in the furniture trade (antique) for several years.—H. T. N.

SOME PHOTOGRAPHIC APPLIANCES.

BY AN OLD HAND.

Backgrounds—Reflectors—Dark-Room Lantern—Small Folding Lantern—Dishes—Oscillating Developing Table.

Backgrounds are plain or scenic, made to roll up after the fashion of a blind, or stretched on a frame like a painter's canvas. Providing there is the necessary space at disposal, those of canvas on frames are decidedly the best, as by this means creases and markings produced by rolling and unrolling are avoided. They may be prepared either in oils or distemper. Although rather more trouble to prepare, those painted with oil paint, either flatted or bright, are the most serviceable, as, in case of leakage from the roof or other accidental soil, it can be readily sponged off without damage, when a background in distemper would be irretrievably spoiled. Again, a distemper background is more easily made and less expensive, and the effect in the photograph is equally good to that of the oil-painted one. We will now proceed to make the foundation for one which will be the same whatever method may be selected for colouring it. Procure some battens the length and breadth the completed background is desired to be. We will suppose one of about 8 ft. high by 7 ft. wide, which is a moderate size, and

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sufficiently large for two or three figures. The wood should be ¾-in. deal, 3 in. wide, the corners cut to overlap, and strongly screwed together, as Fig. 1, additional strength being imparted by corner pieces (B, B, B, B), also screwed on. A bar across the centre—narrow way of the frame—mortised into each side, gives additional rigidity, and affords a convenient hand-hold in moving it, as it goes without saying the face of the background should be handled as little as possible. The frame will now appear as in Fig. 1. The reason for making the corners strong is that, when the canvas is stretched upon the frame, the least giving way would cause the material to pucker and crease, entirely spoiling the effect. Extra bars are sometimes put diagonally across the corners (Fig. 1, A, A, A, A) from the centre bar to outside. Of course, this adds to the weight, and is unnecessary with a background of the size given. The idea is to get a perfectly stiff framing. The lower bar of the frame may be provided with small wooden rollers let into the lower edge as w, w, in Fig. 2. The frame now being ready, it must be covered tightly with calico, which is sold under the name of sheeting, and may be had of various widths. If it can be procured sufficiently wide to do without a join, so much the better; but, if joining is imperative, the seam must be simply sewn and not felled, or an objectionable ridge would be made that no amount of colour would obliterate. Fig. 3 shows how the edges should be put together. The seams must always be vertical, and not across the background. The join being regularly and neatly made, and well rubbed down, spread the sheet on the floor and lay the frame on centrally; turn over one end of the sheet and tack it with tin tacks about 2 in. apart, taking great care to keep it level; do the same to one side, pulling slightly from the already tacked end. Now proceed to tack on the opposite side with a firm, steady pull and a diagonal direction. Keep the sheet as smooth as possible whilst it is being fastened. Lastly tack on the bottom, using a steady pull from the top during the time. Now raise the frame covered with the calico on end. It ought to be quite smooth and free from wrinkles; if not, make it so by altering the tacking, then, with a sponge or large brush, thoroughly wet it all over, and let it dry, when it will be found strained as tightly as a drumhead. Prepare some size—about 1 lb. of size to a gallon of water—and give it a good even coating, and let it dry, when it will be ready to paint. With a piece of charcoal draw two lines diagonally across, as in Fig. 4, to act as guides in the shading. Of course, if only a flat, even tint is required, this is unnecessary; but a shaded background is much better for all purposes than an absolutely flat one. Provide three pots of paint of different shades of grey by mixing lamp or ivory black with white lead. The depth of colour is decided in a great measure by the amount of light that will fall on it when set up for use. A light studio will require a darker set of tints than one in which the light is but moderate. Something also depends on personal taste, whether a light or dark background is required. With a brush well charged with colour of the lightest tint, begin at the left-hand top corner and paint down to the first charcoal line. Scrape the brush, and paint the middle division with the second tint, well softening the two together at the junction; then, with the darkest, fill up the lowest division, well amalgamating the tints where they meet. As soon as all the surface is painted over, work well over it with a softener until the background shows an even graduated tint from one corner to the other. In case of a flatted paint being used, it is almost necessary that the softening should proceed simultaneously with the painting, for, if it is left till the whole is covered, it becomes too dry to make a good job of it. Two persons may very well manage this, one to paint and the other to soften. The background, when dry, is finished, and ought not to show any definite lines of colour, but be one continuous tint, from light to dark. If distemper is used, the same precautions must be taken, the colour being thoroughly brushed into the material, which need not be sized first, the size being mixed with the colour. A little soap dissolved in it is also an advantage, keeping it more flexible. The distemper colour must look considerably darker a tint when wet, as it dries up very much lighter. There is plenty of opportunity for the exercise of individual taste in the preparation of backgrounds. The shading may be varied, or landscapes or interiors painted on it; but, whatever it may be, to be artistic, it must be rather suggestive than definite, and the central part free from any decided pattern or design which would interfere with the lines of the portrait. For genuine work, a design consisting of a panel surrounded with a slight moulding is as useful as any. Simplicity must be always aimed at, for elaborately patterned backgrounds are generally disappointing when partly hidden by the model—a matter more frequently overlooked than it ought to be.

Reflectors partake of something of the nature of backgrounds, being canvas covered with white paper on light frames, fixed on stands adjustable to any angle, for the purpose of reflecting light into the shadows. Fig. 5 represents a reflector ready for use; it consists of a light deal frame 4 ft. by 2½ ft. in size, to the central bar of which is fastened two semi-circular pieces of wood with holes through them (Fig. 6). The upright (Fig. 5, C) may very conveniently be made of an ordinary brush handle, 3 ft. 8 in. in length, cut flat at one end to work in the slot formed by the two semi-circular pieces of wood; a rivet with a screw thread on one end fastens them together, and the screw is kept in position by a winged nut on it. The foot is made of a circular piece of heavy wood 3 in. thick, turned somewhat ornamentally as Fig. 5, D; to the bottom a thick piece of stout lead is screwed to give additional weight and steadiness, three small knob feet are screwed in, and the reflector is finished; it, of course, may be stained, polished, or painted at the taste of the maker; different sizes may also be made, and attached by a ball and socket-joint instead of rivet and nut, or made in metal instead of wood; an old-fashioned iron head rest can easily be converted for this purpose.

The Dark-room Lantern is a very necessary piece of apparatus, and is of two species: one for a permanent fixture, and the other for travelling, or rather for occasional use and portability. The forms in which they are made are very varied, the object in all being to get a good safe light of convenient form, and to be used either with candle, paraffin, or gas. Within a reasonable degree, the greater the volume of light the more comfortable for the worker, providing the quality of the light is such as to have no action on the sensitive surface that will of necessity be exposed to it. Correctly speaking, no light is absolutely without action, and sufficiently long exposure to the most safe light we are acquainted with will produce decided photographic action. If a sensitive plate, exposed for a quarter of an hour to the full action of such light, and can then be developed without fog, the light may be considered safe in practice; this is a very much longer time than there is any necessity for submitting a plate to, but still the caution holds good—never to expose a sensitive film to any light longer than absolutely necessary. A very small subdued red light is very injurious to the eyesight if frequently used, and many workers under such conditions suffer considerable pain, besides permanent injury to the eyesight.

The disadvantages of working in such darkness, for it is little else, are numerous; upsets and breakages are of common occurrence, and development must be somewhat out of the control of the operator when he can, by the utmost straining of the eyesight, have but a faint glimmer of the developing image. All this points in one direction—to have as much light as can be safely used. Owing to the varying sensitiveness of different makes of plates, a light quite safe with one kind would not be so with another. Orthochromatic plates cannot be worked in any except a deep red light, without fogging, but for other kinds, two or three thicknesses of golden fabric will be quite safe for a candle or lamp, besides giving a comfortable flood of light all over the room. In order to obtain a large volume of safe light, a very much larger lantern may be used at home, where it would be more or less of a permanency than would be convenient for travelling. We will proceed to make one as follows: Cut out of oak 1 in. thick a piece the shape and size shown in Fig. 7; this will form the bottom of the lantern, and its weight help to prevent accidental overturning. Now get a sheet of tin plate, sufficient to bend round the curved side of the wood, and turn over half an inch in front on each side, and of the height of 18 in. Fig 8 shows the lantern in its complete state. Solder an L-shaped strip of tin down each side to form a groove, and from this strip, another one 1 in. wide across the curve at the top. A piece of glass, E, can now be slipped down in the grooves, and rest on the rebate of the wooden bottom. After ascertaining if the groove is of proper width in which the glass can slip easily, solder another slip of tin across the top from the outside edge of the groove before the other. Make a tin plate lid, F, with a hole 1½ in. in diameter in the centre, over which a tin cap, G, is fastened. The projecting pieces, H, H, H, are made to pass through the tin lid and act as supports, in case the solder should get melted by the heat of the lamp. The cap is intended as a light trap, and is therefore much larger than the aperture it covers; to the straight edge of the front of the lid is hinged a flap, J, made to fall over the opening through which the glass is inserted, and to prevent any unguarded light from the lantern getting into the room. The lower part of the body of the lantern is pierced with a number of small holes to permit access of air, over which on the inside of lantern is a strip of tin, K, soldered, sloping down towards the light to about ¼ of an inch from the bottom. The bottom itself may be covered with tin, which, if intended for a candle, may be provided with a shallow socket for it. Two pieces of glass, one deep ruby and the other orange, over which has been pasted two thicknesses of golden fabric, to slip into the grooves and either used as required, and if the groove is made of sufficient width both may be used

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together; a coat of black japan over the outside will complete it.

A Small Folding Lantern for travelling may be made of cardboard with a tin lid and base, as Fig. 9. Procure some short cardboard (other material can be used), and cut three pieces 6 in. by 12 in.; in one of them cut an opening 8 in. by 4 in.; lay them side by side on the table, and separated about $\frac{1}{16}$ of an inch; paste over them a

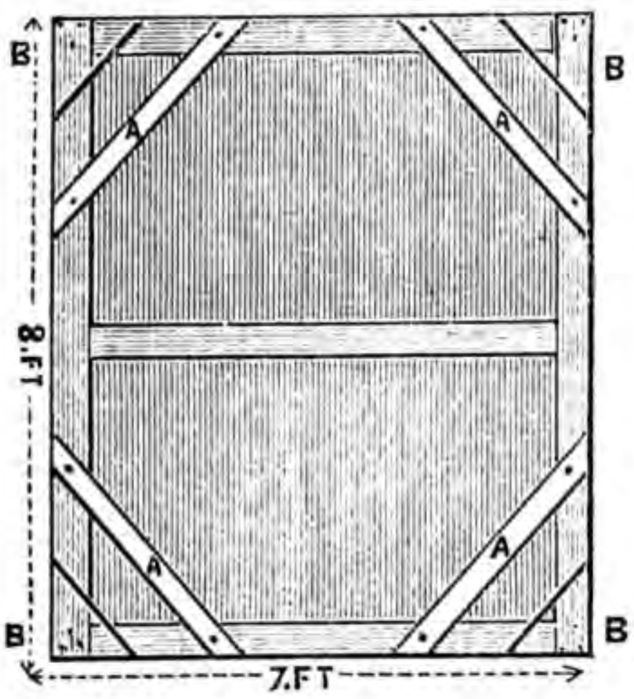

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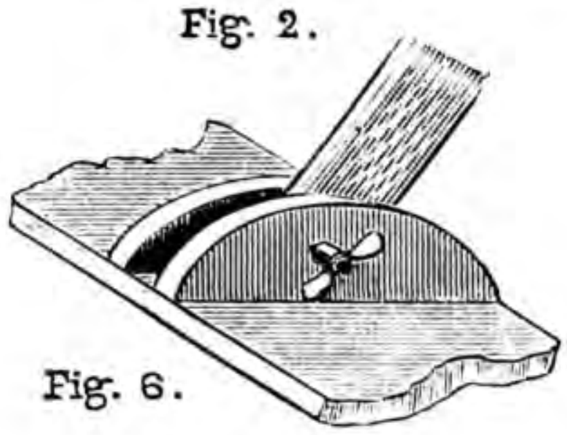
Fig. 2.



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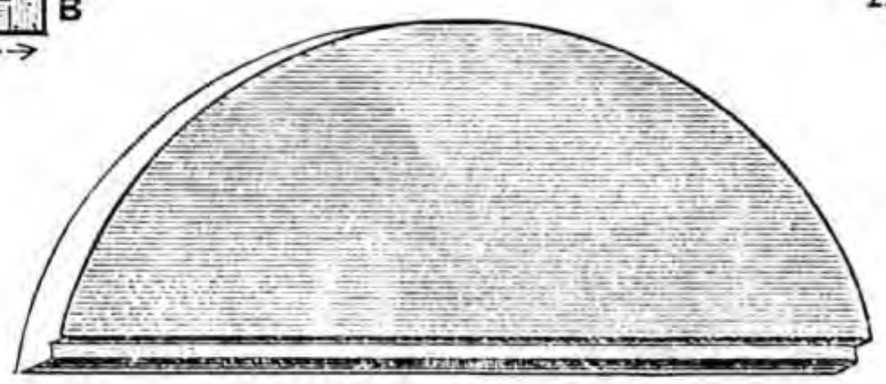

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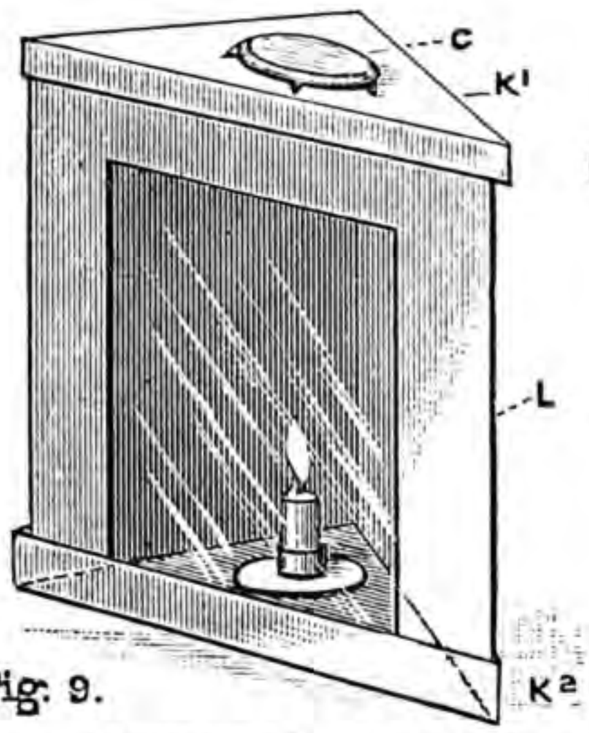

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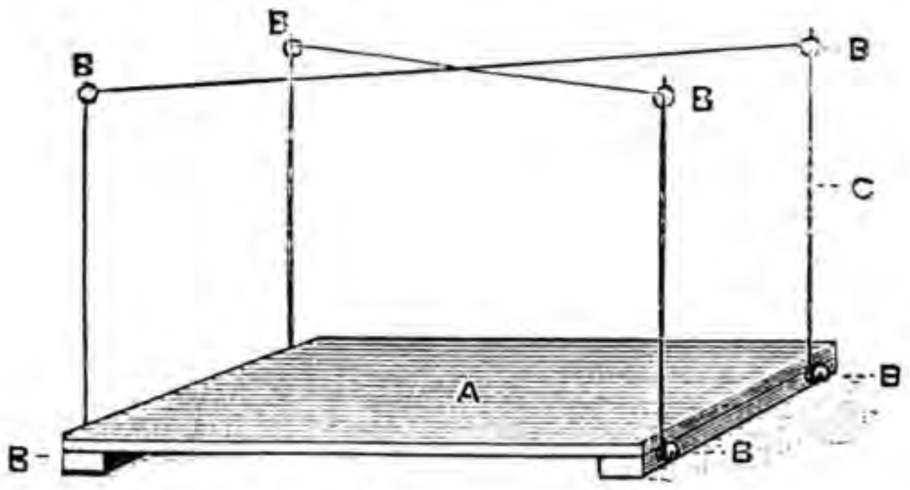

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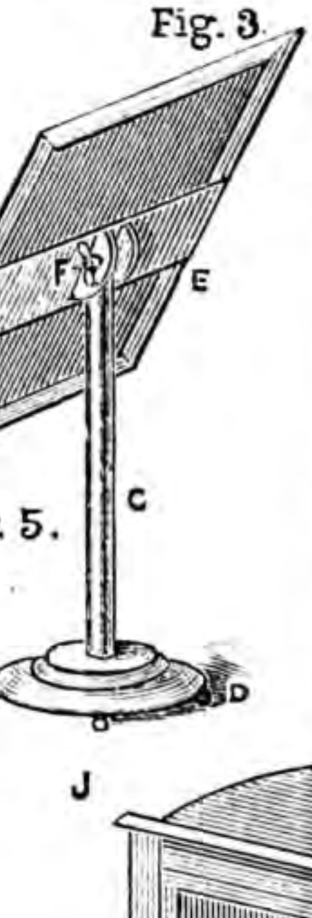

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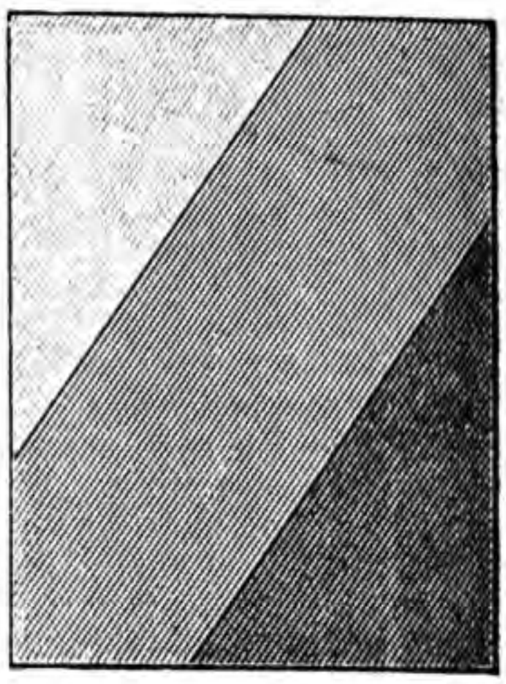

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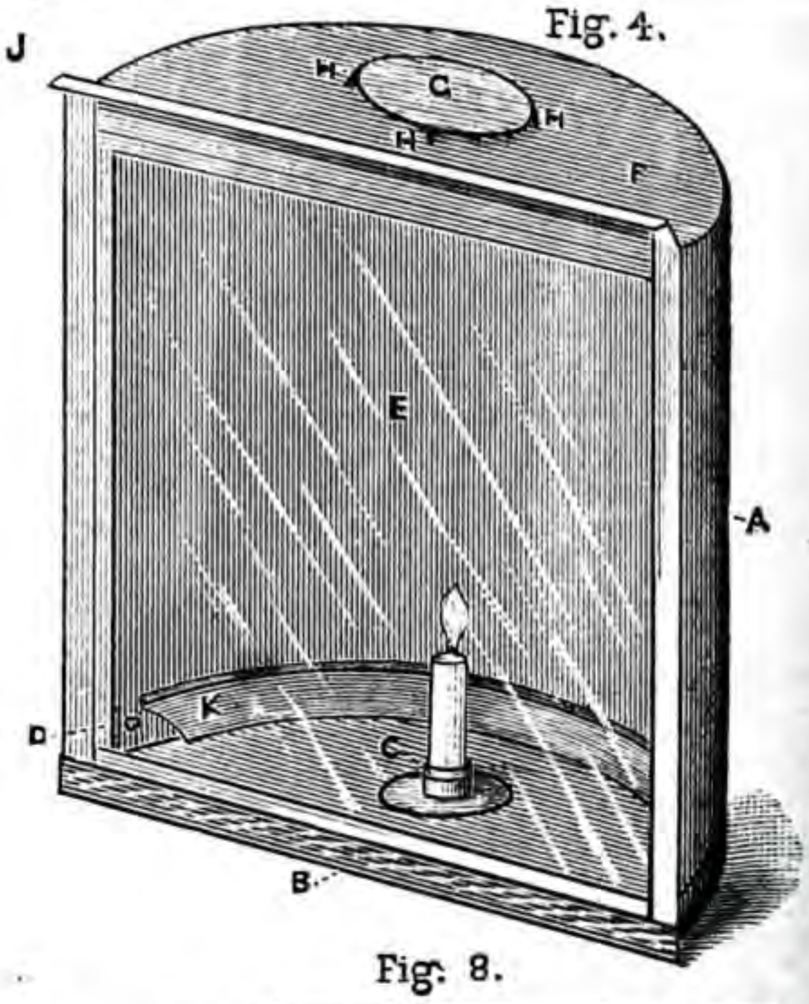

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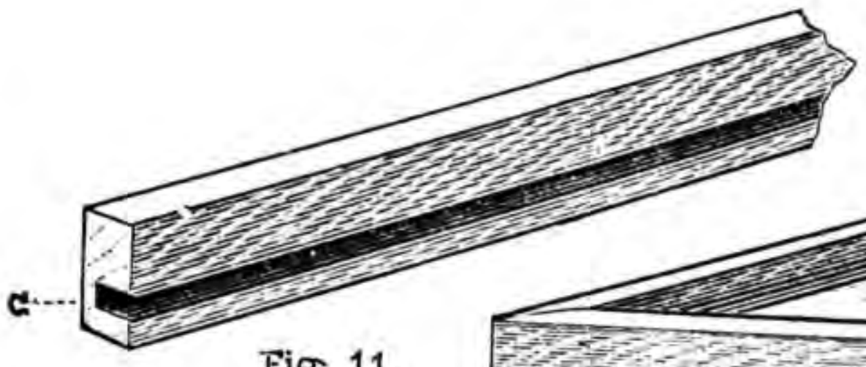

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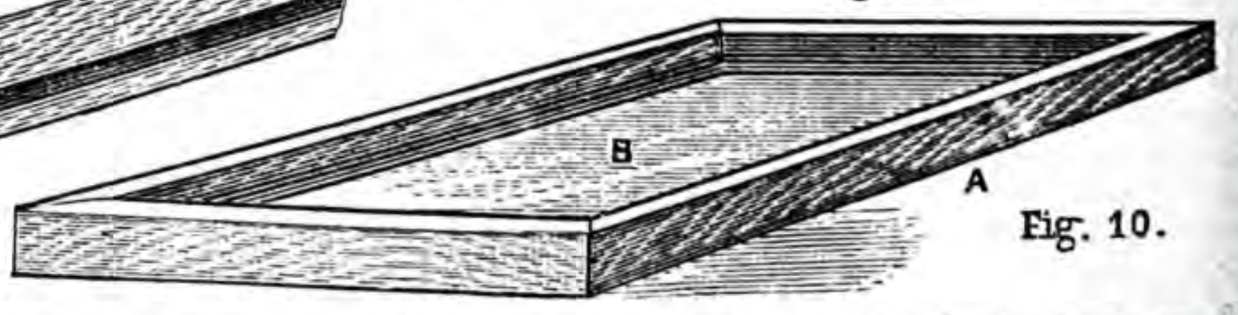

Fig. 10.

Fig. 1.—Background Frame—A A, Struts; B B, Corner Pieces. Fig. 2.—Bottom Bar, showing Wheels, W W. Fig. 3.—Diagram showing Mode of Sewing Canvas together. Fig. 4.—Background spaced for Colouring. Fig. 5.—Reflector—C, Pillar; D, Foot; E, Frame; F, Attachment. Fig. 6.—Attachment. Fig. 7.—Bottom of Lantern. Fig. 8.—Lantern—A, Back of Tin, curved; B, Wood Bottom; C, Candle Socket; D, Air Holes; E, Glass; F, Tin Cap; G, Cover to Chimney; H, H, H, Supports of Cover; J, Hinged Flap to let fall over top of Glass. Fig. 9.—Portable Lantern—K, Tin Cap; K¹, Top Cap; K², Bottom Cap; C, Chimney Cap. Fig. 10.—Wood and Glass Tray—A, Frame; B, Glass. Fig. 11.—Section of Side of Tray—G, Groove. Fig. 12.—Developing Table—A, Table; B, Eyes; C, Endless Cord.

piece of ruby cloth; turn over, and cover the other side with golden fabric in the same manner, allowing both materials to project $\frac{3}{4}$ of an inch beyond the side of the card. Make two tin caps (Fig. 9, K¹, K²), one of which has an aperture about 1½ in. in diameter (capped over as in the other lantern), for the top and bottom. The cardboard sides can now be folded into a triangular form and put over the light, set on the lower lid in a socket (nothing is better than an ordinary night-light), and the top slipped on. This is a very simple and useful lamp for travelling, and not likely to get broken. Cardboard is light, and perhaps as good a material as can be used; the fabric adheres better to it than to either wood or metal after it has been subjected to the heat of the light for a little time, from which it is liable to peel off. The projecting $\frac{3}{4}$ of an inch of fabric is to fold over the crack left; when the sides are set up, two strips are glued to the outside at bottom to fall loosely over the air-holes, M.

Dishes useful for many purposes may be made of wood and glass, as Fig. 10. Suppose a dish is required that will conveniently hold a 15 by 12 plate. Prepare two pieces of $\frac{3}{4}$-in. pitch pine, 2½ in. wide and 17 in. long, and two pieces 14 in. long; cut a groove $\frac{3}{8}$ of an inch deep and $\frac{9}{16}$ in. wide (Fig. 11); about $\frac{3}{4}$ of an inch from one side of each strip of wood mitre and glue two of the corners, partially fill in the grooves with some ground white and red lead, and slide in a piece of stout glass; then fix on the end; when dry, go over the whole with one or two coats of shellac varnish.

The appliances that have been described here, and, indeed, all that have been brought under the reader's notice in previous papers, can be easily made by any one who happens to be tolerably handy in the use of a few of the most ordinary tools that are used in carpentry, and the small amount of metal work, principally the tin-plate work described above, will occasion no difficulty. There are yet a few articles that the amateur or professional photographer may make for his own use, but these must be reserved for another paper. Abundant means of work for the long evenings of winter have been afforded any one who is desirous of supplying himself with his own photographic appliances in making those which have already been brought under his notice.

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THE BEE-HIVE TENT.

INVENTED BY CAPT. H. R. NEWBURGH-STEWART, R.N., WINDSOR.

BY JOHN CHARLES KING.

THE highest range of civilisation seems often to voluntarily revert to primitive methods of arrangement of life, as if to renew with pristine vigour the strife of man with the elements as in early ages of the world. Our Alpine clubs, exploring expeditions to unknown parts in the arctic and tropic zones; the chase of wild animals, with its hardships and perils; all seem to lend a charm to cultured existence, and give a healthy relief to the monotony of a life of ease and the plodding after gain of wealth that often debases existence. Even the exhilaration of a cross-country gallop to the ring of hounds' notes that enliven the chase, which is sure to bring falls, fractures, and sometimes death, to some of the best of the votaries of this manly recreation, yet which is followed with ever-increasing ardour. But the gaps in the ranks thus caused are filled by young men and women who keep life at high pressure enjoyment at the hazard of all risks. But in thus becoming nomads in travel and athletes at sports, there is mostly a stable reliance on a banker's balance, and the world's best resources it commands. The weapons, equipments, cattle, and human help, this balance commands, are a factor which must be estimated at its value here.

The canoe of bark, with its outer covering of skins of early ages, is for our modern tourist converted into a house-boat. For land-travel, tenting-out is popular just now. The tents of all peoples have been the homes and nurseries of nations. How picturesque is a tent, whether of leaves, skins, or canvas! Armies rest beneath them; but adventure and enterprise, as well as war, claim the use of the tent—the untaxed dwelling of the hunter, the tourist, and the emigrant.

Every one thinks he could pitch a tent. Doubtless many who tried would not be quite satisfied with the first attempt. Like everything else, it requires just that handy knowledge of ropes and canvas which few but seamen have. The only landsmen, not of the army, perhaps likely to do the work deftly would be the farm labourers, used to putting up rick-cloths over stacks. Even these men are falling off in their former general handiness, and nineteen out of twenty of them boggle over their rick-cloth raising. Machinery is making them more inert clods than ever, instead of raising their standard of technical excellence. There is an old saying, "He who knows nothing is readiest to learn," presumably because he has not to unlearn error or misteaching.

Tents vary in two essentials, shape and material. Skins form the covering in cold climates, grass and leaves in hot climates. Canvas, from its lightness and strength

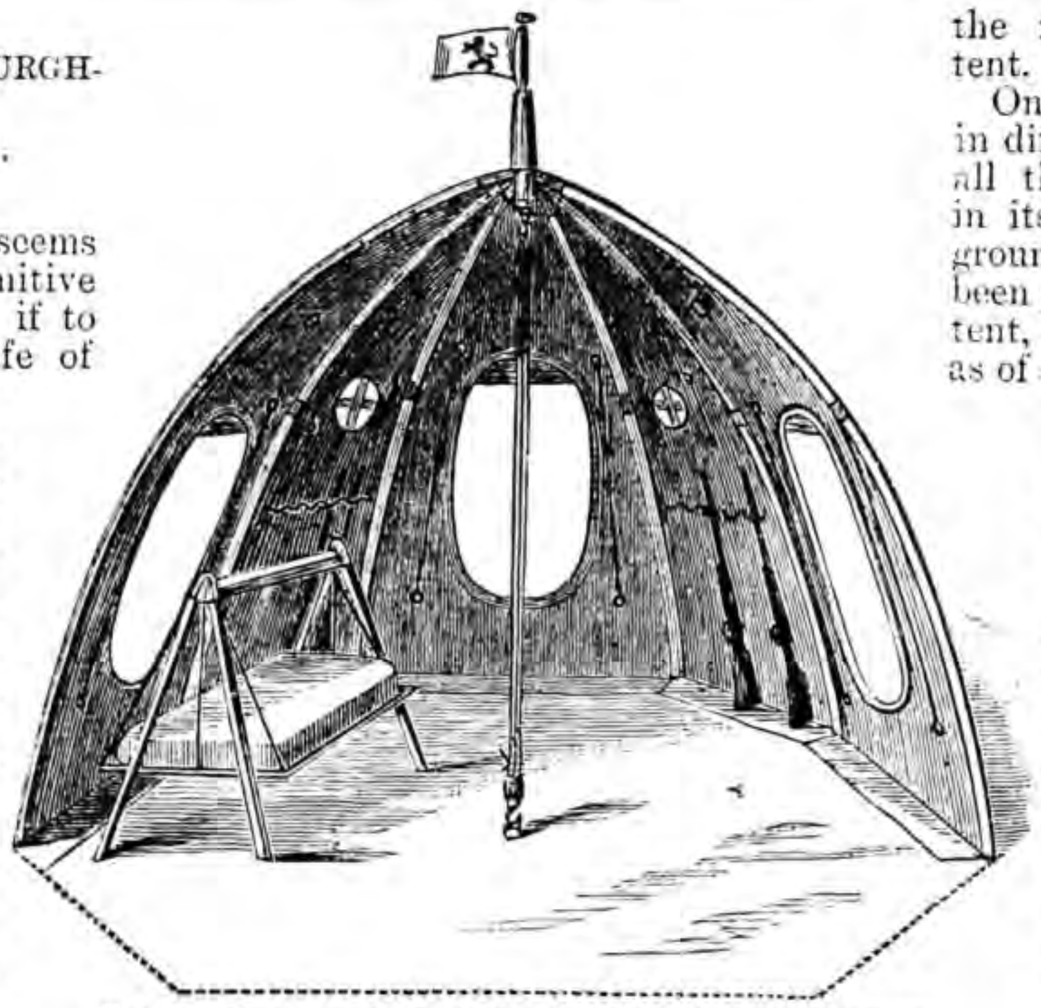

Fig. 1.—Section of Bee-Hive Tent exhibiting Interior.

combined, is the main tent-covering of armies and most of the settlers and travellers who use tents. It is so well known as to need no description, the pole being the central support, and the lines and pegs, the stays to sustain it against the stress of weather.

The shape being conical, gives the least amount of convenient room for the occupant, if moving about in it upright. The middle has a post which may not be pressed against too violently by user or his luggage, or it may snap off, then down comes the fabric, and there it settles till a new post is upreared. This post is the ticklish part of the concern. Move it, and down flops your tent. "It's twelve feet across," says the tent man. He walks round it, and finds it is only about half that for upright range; a sort of no-man's-land is beyond the six feet head-room limit, which is only to be got at by crouching. It is valuable space wasted, where every foot counts for or against comfort. In a storm, beware of letting things touch the tent-cover and draw the rain through the canvas into the tent.

One who spent nine years under canvas in different parts of the world has changed all this. He does away with the post, and in its place puts a cord to a staple in the ground where the post-hole would have been; this cord reaches to the pex of the tent, which is furnished with a "rib-ring," as of an umbrella; this "rib-ring" has spurs with holes to take as many ends of "tent ribs" as may be used. A pin secures each top end of the "ribs," which for convenience are made in two pieces of American elm, or other flexible wood, joined by a simple square-edged oblong socket which retains the jointed ribs securely under any strain, and allows packing away in half lengths.

The tent, when first raised, is a true cone till the pull of the light tackle on the "rib-ring" and mid-staple in the ground brings down the apex to a dome shape, bracing the ribs securely on their bearing on the ground, the canvas preventing their out-spreading there, and the whole being as taut as if it were an expanded balloon.

The no-man's-land of the conical tent becomes exploited, as economists would say, and the bell tent converted to a bee-hive, that makes the user feel there is science in shape which yields the comfort of increased space, security from the elements, and less lumber weight to be carried about in tent moving. The door-openings are covered or opened by the canvas being raised or lowered blind fashion. Ventilators the same way; even the tent may be rolled up all round two feet from the ground for tropical use to gain more air.

To those who do not know anything of the weight of tent fittings, it will surprise them to learn that the conical tents for Indian service require each 100 iron pegs, weighing 300 lbs. The bee-hive tent requires only the iron hold-fasts, and four pegs for storm stays to be put on if wanted; 2,000 ft. of rope is saved. It is estimated that for a regiment with 100 tents, twenty tons' weight may be saved, and the more perfect form of tent for all purposes be secured with great economy of cost and durability. It is about to be brought before the notice of the Minister of War in France, when, if adopted in the French army, it may be noticed and adopted by other nations. But it is as a tourist's or emigrant's tent that we notice its merits.

Fig. 2.—External View of Bee-Hive Tent when pitched for use.

The principle of the tent is as follows:—Fig. 1 exhibits a section showing the room gained, and manner of bracing the rib-ring to the staple in the ground, and Fig. 2 the tent set with two entrances left open. These openings afford convenient means for entering or quitting the tent. On the right of this illustration an entrance is shown closed up, and in each side means of ventilation can be seen which are entirely independent of the larger entrances, which are placed opposite each other in alternate sides of the tent.

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BRITANNIA METAL, BRUSHES, BUFFS, ETC.

BY GEORGE EDWINSON BONNEY.

BRITANNIA METAL—BRIGHT PLATING—BRIGHTENING SOLUTIONS—BRUSHES—BUFFS—BUNSEN BATTERY—BUNSEN BURNER.

Britannia Metal.—This is an alloy composed of tin, 92; antimony, 6·2; and copper, 1·8 parts. This greyish-white alloy, nearly resembling pewter in colour and softness, is employed as the base for a large class of cheap, showy, electro-plated goods. These may be readily distinguished from best electro-plate by the softness of the metal, the thinness of the silver, the low price, and the sound given forth by the article when struck. Best plated goods are made of some hard alloy, such as German silver, and will give forth a sonorous sound when struck, whereas Britannia metal and pewter give out a dull sound. As such plated goods often come to the electro-plater to be replated, it is advisable to know how to treat the goods. After all the old silver has been stripped from the articles in the acid-stripping solution, rinse and scratch-brush them, then soak them in the potash dip for half an hour. Rinse them in a clean, diluted potash dip, transfer at once to a good plating solution rich in metal, and pass at first a strong current, so as to strike them at once with a coat of silver all over. As the deposit thickens, the density of the current should be reduced, or the silver will go on too fast at the finish. Great care must be taken in burnishing a coat of silver deposited on this alloy, or the coat will strip from too much pressure being applied to the burnisher. Whenever practicable, avoid burnishing this alloy, but finish off with soft scratch brushes and the "dolly."

Bright Plating.—It often happens that the silver plater has to electro-plate the insides of tea-pots, coffee-pots, and similar vessels, and he is expected to turn these out of hand in a bright and finished condition in every part. It is quite possible to reach the insides of ordinary sized and shaped vessels with suitably-designed scratch brushes, but there are always some interstices in ornamental and chased work that cannot be possibly reached by mechanical means, and it would never do to leave those parts with the dull white or "matt" coating left upon them when finished in an ordinary silver-plating solution. It is, therefore, usual to make up a special brightening solution to deposit a bright coat of silver on the finished article. The solution for bright plating is made up as follows:—

Brightening Solution.—Take 1 pint of old silver-plating (cyanide) solution, and add to it from 2 to 3 ounces of bisulphide of carbon. Put this in a glass-stoppered bottle capable of holding half a gallon of liquid, and add to it 3 pints more of the old plating solution; then shake the bottle well for a few minutes, and set aside to rest for twenty-four hours or more. Carefully decant the bright liquid into another similar bottle without disturbing the sediment, and add from 2 to 3 ounces of good cyanide of potassium dissolved in distilled water. Shake up the contents of the bottle to mix them, and when all is settled down again, the mixture will be fit for use. The daily dose of this liquid to the bright-plating solution must only be in the proportion of 2 fluid ounces to each 20 gallons of solution. This should be added at the close of each day's work, and well stirred into the plating solution. If too much brightening solution is added, the deposit will be brown, or streaked with black or brown streaks, and the solution spoiled. It should never be added to the ordinary plating solutions, since they are apt to be spoiled for other work by the addition of the brightening solution. The work bring brightened should be closely watched. The brightening effects will commence at the bottom of the article and spread upwards; when the article is covered, it should be removed at once, and quickly rinsed in warm water. *Caution.*—As bisulphide of carbon is a nasty, stinking, poisonous liquid, of a volatile nature, great care must be exercised in its use, so as not to breathe the fœtid vapour, the odour of which resembles that of rotting cabbage. This alone should warn amateurs against sniffing at the bottle containing it or the brightening solution.

Brushes.—In large plating establishments, a number of various kinds and shapes of brushes are employed in the process of scouring the goods preparatory to plating, and finishing them after they have been plated. The brushes employed in scouring the work are made of hog hair, containing one, two, three, four, or more rows of hair,

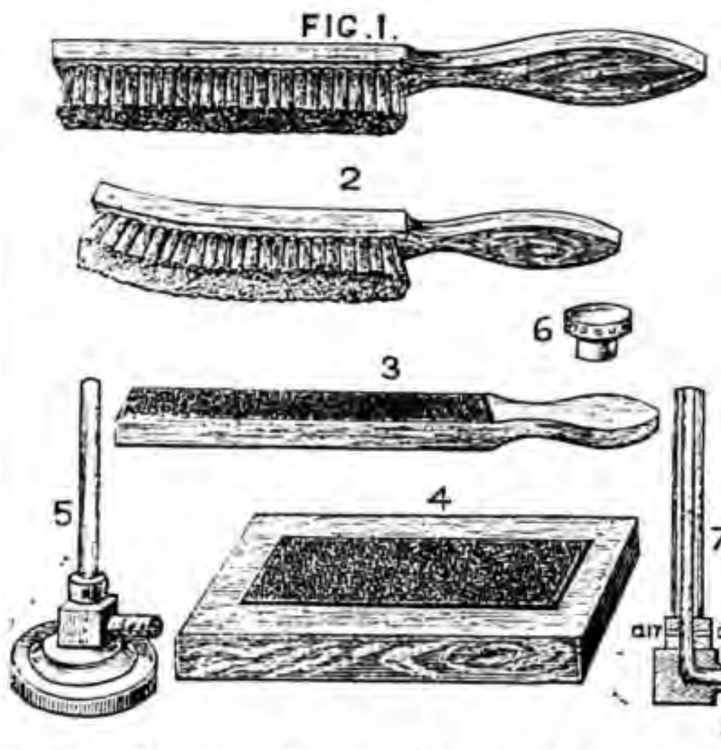

Fig. 1.—Scouring Brush. Fig. 2.—Curved Back Plate Brush. Fig. 3.—Buff Stick. Fig. 4.—Buff for Polishing Burnishers. Fig. 5.—Bunsen Burner. Fig. 6.—Rose Cap for Bunsen Burner. Fig. 7.—Section of Interior of Bunsen Burner Tube.

with solid wood backs (as shown at Fig. 1), in sizes suitable to the requirements of the plater. When first received from the maker, they should be dipped for a moment in the potash dip, to remove any grease there may be on the hair, well rinsed in clear water, and then kept exclusively for the purpose of scouring. Brushes made from cow hair are used to polish steel articles preparatory to being plated with nickel. Camel-hair brushes are used in ornamenting gilded and plated work with coloured varnishes and other colouring mixtures. Ordinary plate brushes with curved backs (as shown at Fig. 2) are very useful tools for brushing the insides of cylinders. Wire brushes are also used in scouring and cleaning iron and steel goods when these are coated with dirt and much corroded or pitted. It is sometimes necessary to use a steel-wire brush for cleaning iron castings before being brassed. The kind of wire brush, known as a scratch brush, will be noticed under the head of *Scratch Brushes* and *Scratch Brushing*.

Buffs.—These are sticks like hand brushes without hair, but with buff leather firmly glued to the wood (see Fig. 3). This buff leather is the tough, rough-grained leather used in soldiers' belts. Buff sticks, like scouring brushes, are made in various widths to suit the work in hand, the broad buffs being used for polishing broad plane surfaces; and the narrow, thin buff sticks for giving a polish to grooves and hollows. They are used with finely-powdered rotten-stone and oil, or with finely-powdered crocus, to give a finishing polish by hand to articles about to be plated. Where polishing lathes are available, the buffs consist of discs of wood, faced with various qualities of leather to suit the several classes of work and the several stages of the polishing process. Buffs are also used to impart a perfectly smooth polish to steel and blood-stone burnishers. When used for this purpose, the strip of buff leather is first boiled in water and dried quickly, then glued to a flat piece of wood a little larger than itself, and weighted with heavy weights until quite firm. The buff then resembles a mounted hone or oilstone, such as is used in carpenters' shops (see Fig. 4). Its use will be explained in the notes on *Burnishers* and *Burnishing*.

Bunsen Battery.—The Bunsen battery as used in this country is made up of an outer containing cell of stoneware, containing a cylinder of amalgamated zinc, inside which is a cell of porous earthenware containing a square bar of carbon. The outer cell is charged with sulphuric acid diluted with from eight to fifteen parts of water, and the inner cell is charged with strong commercial nitric acid. The electro-motive force given by this arrangement is variously stated by authorities as 1·85 to 1·95 volts. The internal resistance of the cells varies with their size, the condition of the porous cell, and the condition of the acid charges; the resistance being variously given as 0·30, 0·08, and 0·06 ohms. These probably represent respectively the pint, quart, and half-gallon sizes of cells used by the persons testing them. The E.M.F. of the quart Bunsen when charged with sulphuric acid diluted with twelve parts of water in the outer cell, and strong nitric acid in the inner cell, may be put down at 1·86 volts, and its internal resistance at 0·08 ohm. This will give a current of about 23 ampères on a short circuit, or 1·72 ampères through an external resistance of 1 ohm. As gold is deposited from its solutions at the rate of 37·31 grains per ampère hour, this current will deposit 64·17 grains per hour. It will also deposit 105·50 grains of silver in the same time. As, however, silver is best deposited with a low E.M.F. of from 1·5 to 1·6 volts, and gold with an E.M.F. of 1·2 volts, the Bunsen has a tendency to deposit both of these metals in a rough condition, unsuited to work that must be burnished. It has been found in practice that the Bunsen cell is well suited to gilding and silvering small articles, such as chains and trinkets, slung to fine wires offering a high resistance; but, for spoon and fork work, and plating or gilding on large surfaces, the current from a large Daniell, Smee, or Wollaston is preferable, because it deposits a coat more amenable to the action of the burnisher. The Bunsen cell, however, has become a favourite with platers and gilders working in a small way on trinket work, because it is easy to set up and cleanly in working, thus causing very little labour in setting up and putting away. French platers charge the inner cell with strong sulphuric acid, and thus get a milder current with an entire absence of those nitrous fumes which render the presence of the Bunsen intolerable in close workshops. The current from the French Bunsen has an E.M.F. of 1·8 volts at starting, but it soon falls to 1·6 or 1·5 volts when the circuit is closed, because the sulphuric acid is inferior

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to nitric acid as a depolariser. Readers interested in the working of this battery are referred to the articles on this subject, in Nos. 1, 2, and 3 of this volume of WORK. In large plating establishments, dynamo machines are largely superseding the use of batteries. (See also note on *Batteries.*)

Bunsen Burner.—This useful gas burner (shown at Fig. 5) should be found in every work-shop. It is composed of a small short burner inside a piece of gas barrel some five or six inches in length, to which air is admitted at the lower end. The air mixes with the incoming gas in the barrel (see sectional sketch, Fig. 7), and the mixture burns together at the top with an intensely hot, smokeless, and non-luminous flame. This flame is well suited to the operations of soldering, brazing, and other blowpipe work, and also for heating and fusing small quantities of material. When the tube of the burner is surmounted with the cap shown at Fig. 6, the flame spurts out of the holes, and forms a "rose burner," to heat a sand bath or boil water.

OUR GUIDE TO GOOD THINGS.

**** Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of WORK for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of any one who has a useful article for sale to obtain mention of it in this department of WORK without charge, the notices given partake in no way of the nature of advertisements.*

114.—WATKINS' NEW PATENT SOLDERING FLUX.

THIS new flux, invented by Mr. J. H. Watkins, 29, Alma Street, Eccles, near Manchester, is intended to supersede resin, spirits of salts, etc., for soldering electric light, telegraph and telephone cable joints, as well as ordinary work in tinplate, brass, copper, zinc, and lead. The inventor represents it as being a solution of resin in a volatile solvent which has no corroding effects on metal, and which, on the application of heat, volatilises and leaves a coating of resin on each part of the work to which it has been applied, and being in a liquid form easily permeates any joint. Mr. Alexander, who tested the flux for me, says:—"It appears to be resin dissolved in either benzoline or methylated spirit. I find that it can be used for soldering tin, lead, copper, brass, zinc, etc., but as to its superseding spirits of salts for general work, I do not think it will. My experiments go to show that on lead, pewter, and other soft metals it acts very well indeed, but on copper, brass, tin, and zinc it is not to be compared with spirits of salts. The reason of this is plain. The patent flux is a flux and that only, but spirits of salts, either raw, as in the case of zinc, or 'killed' and diluted for the other metals, has a cleaning effect as well as being a flux. This difference was very marked in the experiments with copper-plate, the spirits causing the solder to flow on and thoroughly join two pieces of uncleaned copper, just as it was cut from a sheet, better than the patent flux did on two pieces with cleaned surfaces. Experimenting with tinplate work, I find it acts well, and has an advantage over spirits in the fact that it is non-corrosive. But then we have always had a non-corrosive flux in the old-fashioned resin and oil, which has an advantage over the patent flux for tinware in the fact that it can be easily wiped off, which the patent flux cannot be, as the solvent evaporates and leaves the resin, etc., on the work. This, of course, in the case of electrical work, is a distinct advantage, and I am pleased to be able to say that I think very well of it for this class of work, being really convenient, effective, and economical." THE EDITOR.

SHOP:

A CORNER FOR THOSE WHO WANT TO TALK IT.

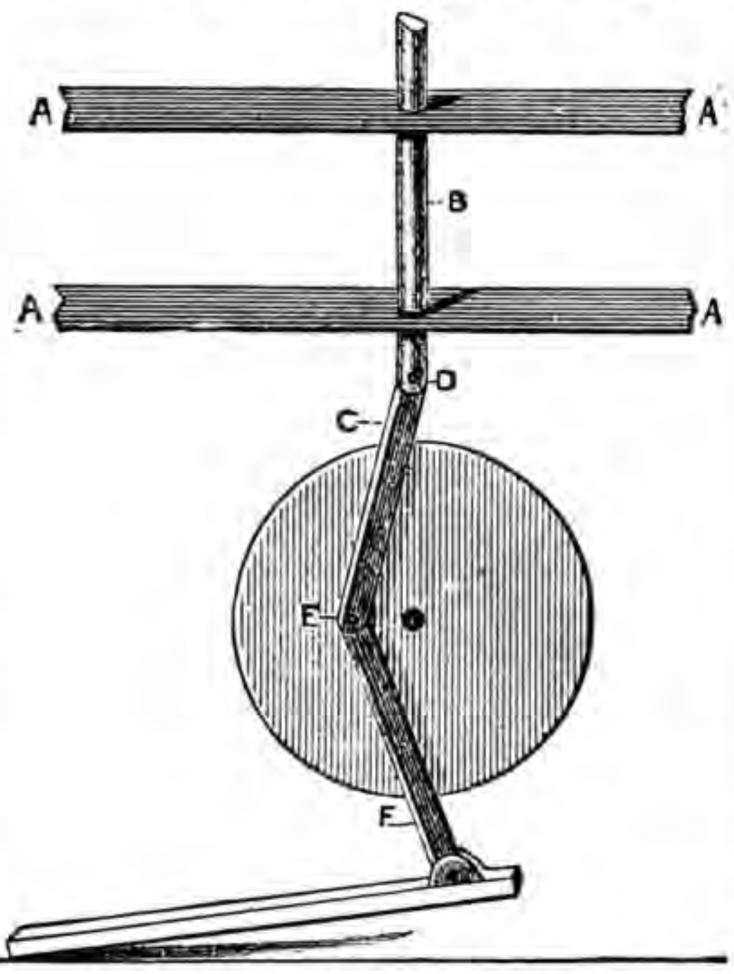
NOTICE TO CORRESPONDENTS.

**** In consequence of the great pressure upon the "Shop" columns of WORK, contributors are requested to be brief and concise in all future questions and replies.*

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of WORK in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.

I.—LETTERS FROM CORRESPONDENTS.

An Easily-Made Fret Machine and Wounds.—MEDICUS (*Hampstead*) writes:—"I thought perhaps it might be that I was extra stupid as I could not understand how the fret machine described by W. R. S. could possibly be made to work, but as I see, from the numerous inquiries with regard to this, that others are in the same position as myself, I begin to think I am perhaps not such a fool after all. The general idea of the machine sketched by W. R. S. is certainly good, and I am very much obliged to him. I intend to make one for myself, but I think in one or two details it may be considerably improved. He says his machine works well. If it does, the sketch he gives on page 332 of WORK must be at fault, for it is morally certain that if constructed as there depicted, the wheel could not possibly revolve. I imagine that the upper end of the piece marked C, which is hinged to the shaft, A, ought to have been placed on the inner side of the shaft, viz., between it and the wheel. With this arrangement the friction between the lower bearing and the shaft must be tremendous, as the latter must be bent out of the perpendicular at each revolution of the wheel. I enclose a rough sketch of the alterations I intend to make to obviate this. The wheel will be of wood, with



An Easily-made Fret Machine.

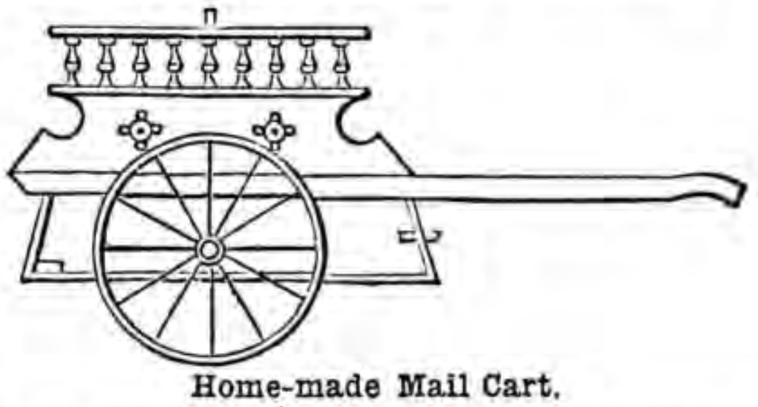
A, A, Guides; B, Shaft connected above with saw below hinged at D with C, a flat strip of iron, the lower end of which is fastened to the wheel and the treadle crank, F, by a pin at K, which passes through both and is bolted to the wheel.

strips of lead nailed round the circumference to give the requisite weight and driving power. Now to touch on another matter on which I do not write as an amateur. I refer to the bad advice given in your issue of September 14th with regard to treatment of cuts. If this advice is followed, I beg to point out that it will, in many instances, be productive of very serious results. To get a cut to heal, it should first be thoroughly cleansed with warm water, then the edges brought together if the wound is small by strips of sticking plaster, or strapping, if large, by as many stitches as may be necessary of silk or silver wire. The wound should then be bound up with a clean bandage, and the part be subsequently kept at rest if possible. Absolute cleanliness and rest are essential to insure rapid healing of a wound. The use of such remedies as French polish, glue, which is often in a state of decomposition, and common pins, is simply barbarous. They are only calculated to cause irritation, set up inflammation which spreads, and often renders it necessary to remove the affected limb in order to save the patient's life. This, I can assure you, from an experience of many years at one of the largest London hospitals, is no infrequent termination to a wound which, though slight at first, was neglected or improperly treated."

Noisy Fret Machine.—W. J. S. (*London, E.C.*) writes:—"I notice that G. W. J. (*Sheffield*) (see page 588) complains of his fret machine making a noise. If he will place rubber pads under the feet (as I do mine) they will materially deaden the sound, and thus remove some of the mischief."

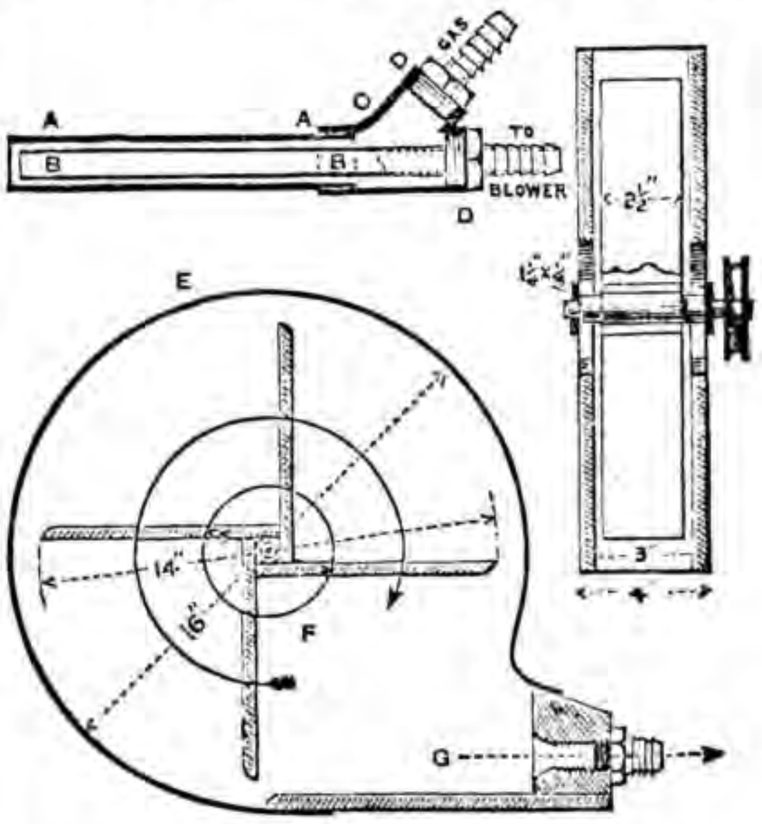
Lock Repairing and Key Fitting—Erratum.—Mr. THOS. WILSON writes:—"I see your engraver has made a mistake in copying Fig. 5, which appeared in No. 24 of WORK. It should be as per figure in the margin. It is made out of a single piece of wire. The text is quite correct, but the inscription should be 'Lock Pin,' and not 'Mode of Repairing Pin.' They cannot be repaired. Inscription of Fig. 6 should be 'Desk,' and not 'Drop Lock Bolt.'"—[All contributors should be careful to write inscriptions under all figures sent. Not one in ten does so, and they have to be gathered from the text. In future all diagrams, etc., sent without inscriptions will be returned, that they may be filled in.—ED.]

Mail Carts.—R. H. (*Newcastle-on-Tyne*) writes:—"I notice in WORK No. 30 sketches of mail carts. I have just finished one, as below. There is one point that I think is of general importance. The steel spring is not necessary, but can be advantageously replaced by frame of pitch pine 1 in. square, to which axle is bolted."



Home-made Mail Cart.

Blowpipe and Fan.—ANIMO ET FIDE (*Loughboro', Leicestershire*) writes:—"I desire to thank A. S. P. very much for his lengthy and exhaustive answer to my query *re* bicycle repairs tools, which has been of great help to me, and taking advantage of his kind offer to give further help and information through 'Shop,' have enclosed tracings of blowpipe and fan I have constructed, and should be glad of his opinion as to their capabilities; and if they would be suitable for brazing up a bicycle, the fan driven from about a 16 in. diameter pulley; and as I have not seen any brazing done by blowpipe, I should be glad of a few hints regarding procedure. Also, can anything be soldered that has been hardened without softening it at all?"—[I can hardly speak with confidence regarding the capabilities of the blowpipe shown in drawing by ANIMO ET FIDE, as I braze only with charcoal furnace. A good blowpipe, however, is preferable, as it makes a cleaner job, and the work is much easier cleaned and filed up; besides, there is less danger of burning the thin tubes. I have not seen a blowpipe of the form shown by ANIMO ET FIDE. It would be an improvement to curve the nozzle to one side, so as to throw the flame down on the work



Blowpipe and Fan.

A, A, Ordinary ½ in. iron gaspipe; B, B, ordinary ¾ in. (outside diameter) brass tube; C, Malleable iron T piece; D, D, Brass unions for indiarubber tube; E, Sheet iron casing; F, Air inlet; G, ½ in. gaspipe.

being brazed, while the tool is held conveniently in the hand. With regard to the fan, I should have the blades of a 16 in. fan not less than 3½ in. or 4 in. broad, and curved to a radius of about 12 in. The curved blades would be driven backwards, that is curving away from, not towards, the outlet, the backs of the blades thus driving or beating the air outwards towards the circumference. Such a fan and pipe ought to braze all the parts of bicycle frames. It should be used with a lump of charcoal

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under the work to be brazed. For some of the joints where solid stampings are inserted to be brazed into the tubes it may be necessary to make a clear charcoal fire in conjunction with the blowpipe, the charcoal being brought up to a good red glow under the work. The blowpipe, acting on the upper side, would bring up the necessary heat much quicker. To braze a hardened article would certainly soften it, but it would be hardened again considerably by plunging in cold water while yet red hot, but it would depend very much on the nature or use of the part thus treated whether or not it was not spoiled. For instance, a ball-bearing case would almost certainly be warped off the truth by such an operation.—A. S. P.)

II.—Questions Answered by Editor and Staff.

Dulcimer Dimensions. — Will (*Norwich*). — You will find the subject most exhaustively treated in the articles on the Dulcimer commenced in Work No. 31. The only allowance you will be obliged to make will be in the position of the inner and outer bridges, and the sound-holes. These will be 2 inches further from the sides than in the description, and your instrument would be tuned in the key of D. The proper dimensions of such an instrument would be, width at bottom 2 ft. 10 in., width at top 1 ft. 4 in., back to front 1 ft. 4 in., but if you desire to build one 3 ft. wide at bottom, then the top must be 1 ft. 6 in., and the depth 1 ft. 4 in., and strung with one size stouter wire.—R. F.

Pencils for Lettering, etc.—X.M.T.C.C. (*Belfast*).—Sable pencils, either for decorative painting or for sign writing, are named from the bird which the quill holding the hair is supposed to be taken from—thus lark, crow, duck, goose, and swan quills. The goose, or full-goose size, would be a medium quill, and its cost would be: goose, about ninepence, and large goose fifteen pence. These two sizes with a duck quill, costing about sixpence, would suit for almost anything up to six-inch work, using a flat long-hair fitch for filling in the letters. The best place to get them is of a large dealer; there are several in Belfast. Observe that the quill is well filled and the hair securely fastened. The brush should taper to a fine point, and should maintain the point unbroken when in use. When buying, wet the brush (they usually go into the mouth), and then whilst wet and the hair thus holding together, test the point by twisting it upon one's nail, making all sorts of imaginary circles and turns. If the point keeps firmly together and the brush works with spring and solidity it is a good article, but if the point splits up and the hair spreads about, try another one. Recently a good class of pencil for writing and so forth has been introduced which is made from brown ox hair, some call them "Taurus" pencils. They are not so fine as sable, but are considerably cheaper, and answer capitally for general use. Gilding and embossing on glass is almost a distinct art and craft, and would take much space and painstaking description to explain thoroughly. Doubtless it will appear in due time. For the embossing, acids and a thorough knowledge of the matter are necessary, whilst the gilding is done by weak isinglass medium, and then backed with black japan. You will surely now agree that, however sorry we are to refuse any inquirer, this time you have asked "too much at once."—F. P.

Smithing. — (*Birmingham*). — The articles on Smithing have already been resumed, and several branches of the art treated in an exhaustive manner. I think our papers will be far more useful to men of your trade than the book you name, and of which you say "the information you get out of it is not worth 2d." It requires a practical man, you know, and not a mere theorist, to write usefully and with effect on manual labour of any kind, and the way in which it is best done. There is no other cheap work on the subject that I can recommend to you and your friends except "Steel and Iron," by William Henry Greenwood, F.C.S., M.I.M.E., one of Cassell's excellent Manuals of Technology. It is sold at 5s. Possibly you might be able to get a look at it in the Free Library, if such exists, at Birmingham, or the library belonging to any workmen's institute there.

Prices of Batteries.—Manager Electrical Co. (*Crewkerne*).—I am obliged by your communication. Your company should advertise their goods in the sale column of Work. Manager gives the following as a list of prices of Leclanché batteries supplied by the Electrical Company, Crewkerne:—

No.	Complete.	Zinc Rods.	Carbons Capped.	Porous Cells, Charged.	Glass Jars.
1.	1s. 6d.	2½d.	6d.	1s. 0d.	4d.
2.	2s. 0d.	3d.	7d.	1s. 5d.	5d.
3.	3s. 0d.	4d.	8d.	1s. 9d.	7d.

Sal-ammoniac is also supplied at 8d. per lb.

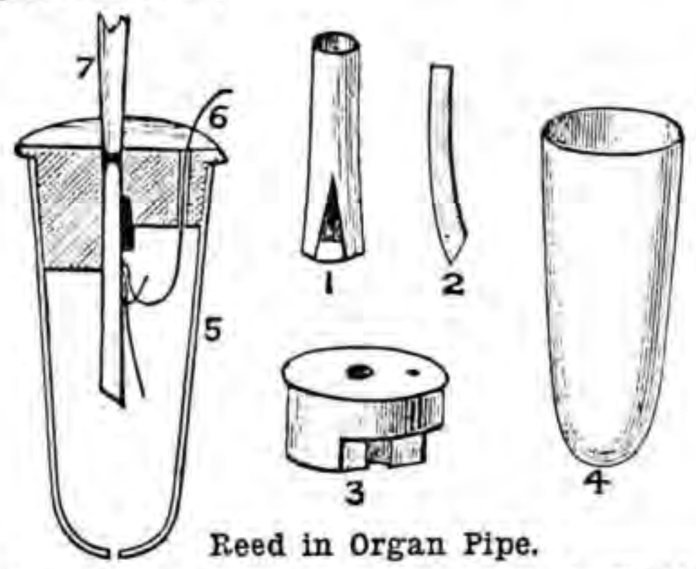
The prices quoted in the article were certainly the top prices from the price list of a London firm. Several country firms, including your own, supply the goods at lower prices, but all are not of equally good quality. I must repeat, do not hide your lights under the obscurity of your provincial towns, but advertise them through the world-wide circulation of Work.—G. E. B.

Dwarf Bookcase.—H. J. (*Bradford*).—I presume you mean a dwarf bookcase, though the sizes you give are very small even for one of these. Without going into full details, which cannot be given in "Shop," the following details may help you in making a plain one. Connect the ends together with a board of the same width at the bottom and at the top either with a couple of stays, one at the back, the other in front, or with a piece the same as the bottom. Use the lap dovetail form of joint. Below the bottom board fasten a plinth, for making which you will find directions in the articles on "Lessons from an Old Bureau." Fasten either a plain or lined-up top, using screws through the stays referred to. "Lining up" has been exhaustively treated, and if you do not understand this work, you should read the articles about it before proceeding. It is usual for dwarf bookcases

Dwarf Bookcase.

to have the front edges of the ends thickened up by adding a pilaster to them. This forms a rebate within which is the front rack, by means of which the shelves are made movable to any distance required from each other. It will, however, be simpler for you either to nail the shelves or to support them on slips of wood nailed to the ends. The back should be munted, but plain jointed stuff if dry would do very well for such a small job as you contemplate. Thickness of material throughout for ends, top, and shelves may very suitably be ¾ in., but there is no definite rule to go by, and even ½ in. stuff with judicious lining up might be used. The illustration shows the kind of bookcase. You will easily be able to add a door if you wish to have an "enclosed" job.—D. A.

Reed in Organ Pipe. — Amateur Organ Builder.—The reed in a reed pipe of an organ is the small metal tube in or against which the flat metal tongue vibrates. As it would appear that you have had no previous practice in this work, I think you would do well to buy the parts ready made, and even then you will have a very troublesome job before you succeed in getting the pipes to sound properly. The following sketches will explain how the various parts of a reed pipe are put together.—M. W.



Reed in Organ Pipe.

Fig. 1.—The Reed. Fig. 2.—The tongue. Fig. 3.—The block. Fig. 4.—The boot. Fig. 5.—Showing reed and tongue fixed in block by wedge. Fig. 6.—Tuning wire pressing against the tongue. Fig. 7.—Foot of pipe standing in hole over the reed.

Retinning of Stewpans, etc.—G. S. (*Langley, Bucks*).—To reply fully to your query would take up more space in "Shop" than could be spared for it, but I will endeavour to give you as much information in a small space as I possibly can. With regard to the tinning of copper stewpans and other kitchen utensils, you must proceed as follows:—First do all the needful repairs, such as taking out the bruises from the sides and bottoms by means of a hammer on the proper tools, viz., side stake and bottom stake; see that all the handles are tightly fixed, if not, rivet them up a bit; they must next be freed from grease. This process is called burning off, and is done by placing them on a forge over a good fire of charcoal, and gently blowing till the grease is all melted and burnt off. Care must be taken not to allow them to get red hot whilst doing this. Procure some strong spirits of salts and pour some into a dish or basin. Make a kind of swab by wrapping some cloth, sacking, or canvas round a stick; dip this in the spirits and rub the stewpan all over, inside and out. After this, well wash them with water, then take some blacksmith's "scale"—that is the iron that flakes off the red hot work as the smith hammers it on his anvil—and with a piece of old carpet well scour them all over. You must do this disagreeable job thoroughly, for on this your success or failure will depend; there must be no shirking it; scour handles as well; they will have to be done again, but it makes it easier to do them a bit at this period. Having finished scouring, rub the outsides all over with salt or salt and whiting mixed to a paste; this protects the copper, and prevents the fire tarnishing them so much. They are then ready for tinning. Several other things must be got ready. Some pieces of sheet iron must be turned to slip on the handles to take hold of while tinning. A tinning rod will also be wanted. This can be made by bending a piece of 3-16th or quarter rod in a series of rings, like a hair-spring of a watch. Leave the handle about 18 in. long with an eye at the end to hold by. Pound up some sal-ammoniac in a mortar, and get a wad of tan to wipe the tin off with. You will also have to rig up some arrangement to blow the fire with your feet; an old stump hung on the handle with a piece of chain is the usual thing. Have your tin run out in strips like solder; I find this the handiest form to have it in. Now place everything ready to hand, and commence to tin. Place a stewpan on the fire (sheath on handle); hold it in the left hand. Throw a little sal-ammoniac in and blow gently, and rub a stick of tin against the part that is over the fire. When a little has melted into the stewpan rub it about with the tinning rod, applying a little more sal-ammoniac and tin occasionally as required. The sal-ammoniac will turn black, but that will not hurt. Keep rubbing, and you will find it greatly helps to tin. Do not get the things too hot and burn the tin, but keep a nice heat so that the metal flows easily. Having gone all over it, and supposing it well covered, run it round once more, getting it well hot, then quickly take it off the fire, dust in a little sal-ammoniac, and then with a ball of tow wipe it round, drawing all the superfluous tin out. This will require some practice before you can hope to do it well. They are then well scoured all over again, inside and out, with silver sand, using tow as a rubber. Do not use the same piece for the inside as you do for the outside, or it will turn them black. Use plenty of water. Do one at a time; do the outside last, and dry off quickly in dry sawdust. Polish up the insides with flour, and the outside with crocus. With regard to retinning tin dishes I advise you not to attempt it. If they are small ones it would be a waste of time and stuff, as it would cost more than new ones, and if large dishes, such as milk coolers, etc., it would be best to send to a firm that does such things, as they could not be done over a fire, but would require a large bath of tin of several hundredweights, which I presume you have not got. Some more information on tinning that may be of service to you will appear in my next article. I know of no work on the subject of tinning, but trust the above instructions will afford you all the information required. If not quite clear on any part write again. My object is to help all those who are anxious to learn.—R. A.

Battlesden Cart.—H. P. (*Canterbury*).—I was glad to get your letter on the subject of Battlesden Cart, particularly as I see from it that you are a practical worker. You are quite right in your stricture on the hind step. It should undoubtedly have been represented rounded to match front. With regard to the wings, I think they present too much of a "paddlebox" appearance when carried down behind, as you suggest, and there is no danger of mud being splashed upon the occupants of the back seat. However, this is altogether a matter of taste. Many thanks for your kind words of appreciation of Work. I hope you will be able to carry out your intention of getting a lathe. Get a good one when you go about it. I have just got a Britannia Company's No. 14, and am delighted with it.—Opifex.

Printing Ink.—E. C. M. (*Ipswich*).—You will find no book which will tell you how to make up various tints, as there are, up to the present, no standard colours; and you will find every maker's colours differ a little, and very often even the same maker will not be able to match exactly the shade of colour as previously supplied, therefore experience alone can teach you. You can buy all the dry colours ready for mixing nowadays from the very cheapest to the best.—J. F. W.

Crystoleum Outfit Cost.—Carp Diem asks the cost of an outfit for crystoleum painting, and says Reeves' prices are high. I have not the slightest interest in recommending this particular house, further than this, that I have purchased material there, and have found them as cheap and good as any other house offers. I think that perhaps C. D. asked the price of an outfit which would include everything that an expert would require. The fact is a beginner does not require such a full set as would be comprised in an outfit. The ten colours I have mentioned will not cost more than about 3s., and can be obtained at any good stationer's or art dealer's. And really there is no need to purchase all those I have mentioned for a beginning. I should say 5s. would purchase all that would be required to begin with, which is not a very large sum. C. D. says he thinks he can get them cheaper. Perhaps he will try and let others know if he succeeds. I would recommend C. D. to procure a catalogue from Reeves, Newton & Wiltons, or some other dealer in artists' material; then he will see price of what he requires.—O. B.

Paraffin Wax. — Glu (*Manchester*). — I think you will find no difficulty in incorporating either your pigments or tube colours in the wax, if you

will proceed as follows: Melt the wax in a water bath, then introduce your colour; stir till amalgamated, remove from fire, and continue stirring till nearly set. This is the plan druggists use to colour their ointments, etc.—P. W. S.

Sale of Fretwork.—GEORGE L.—You say, "I have taken very kindly to fretwork, and have bought a fret machine. I now want to recover what I paid for it, by selling the work I do with it. Can you put me in the way of disposing of it?" You do not say where you live. If you reside in a small town there is not much chance for you, but if your tent is pitched in a large one you might try the dealers in fancy goods, or start a window somewhere on your own account, giving the proprietor of said window a commission on everything sold, as remuneration, or as hire of window and for services rendered. Again, you might try to get orders for fret cutting from upholsterers and others in the town.

Tempering Chisels.—CHISELLER.—No, my friend, your query has not been overlooked; but as, owing to the pressure of correspondence and the impossibility of putting more into the space allotted to "Shop" than "Shop" will contain, coupled with the fact that "Shop" was full up to No. 30, and there was yet more to be used before your letter arrived, it is manifest that in the common course of nature your want could not be met by the date of your second letter. Tell your friend to read reply below to E. L. (*Reading*) *re* Steam Launch. I cannot deal with "what are known as examination catch questions in Applied and Theoretical Mechanics, Steam and Steam Engine, etc.," except through "Shop." If you are in any difficulty, and want a leg over the stile with regard to any question, send the question, and, if possible, you shall have help.

Steam Launch.—E. L. (*Reading*).—The contributor who was to write on the construction of a steam launch has had his hands full ever since WORK was commenced, but he assures me that if he cannot manage to tackle the job himself during the coming winter, somebody who is competent to do it shall be found to take his place. From this you will see that it is not in my power to say with any exactness when the papers will appear, nor can I attempt to say what may be the "dimensions, speed, number of passengers, and probable cost" of the launch to be described. One word more both to yourself and others who send *noms de plume* to be prefixed to replies to their queries—choose short ones. Such lengthy affairs as "One who is anxious to know" take up more room than is necessary. Anxiety for knowledge is most praiseworthy, but this is implied by the fact of your writing. For this reason I have replied to you under your initials, and name of town in which you live.

Silk Winder.—D. B. S.—Unless you understand the work of unwinding the cocoons, which you presumably do not, it would be useless to give such a description of a winder as would be of any service to you. However, it may be said that you do not require to accelerate the speed, and that a simple drum or reel, which can be turned, is all that is indispensable, and that it must not be turned too quickly. A rough outline of the process may assist you, and after reading it you will be able to judge for yourself whether it is worth while pursuing the subject further. The cocoons must be soaked in warm water to dissolve the gummy substance in them. The loose ends are then to be caught and passed through small eyes of some polished smooth material such as glass. During their passage through these, of which there are a series, they are gradually united till they form one thread which is then wound round the drum. This must be at such a distance from the vessel containing the cocoons that the silk is dry before reaching it. The operation altogether is a very troublesome and tedious one, and the result—with a small quantity—not commensurate with the labour.—D. A.

Plush Frames.—PLUSH.—A paper describing the construction of easily-made plush-covered frames is under consideration, meanwhile I may refer you to the various hints already given in WORK *re* frame making generally.—D. A.

Boy's Barrow, Cage, and Secretaire.—ROUND O.—I am afraid the first subject is hardly within the scope of WORK, but the others are, and papers on them will be given. With regard to the latter, let me tell you that secretaire is a generic term for writing tables of various kinds, and that by itself it conveys no meaning of the special shape or arrangement desired, so that I am unable to say whether any of those which are contemplated for early consideration will be exactly the thing you want. I may, however, tell you that the plain pedestal table will be among the first, but as you say you are only a "third-rate amateur" it will be a difficult job for you to tackle. I am afraid though that with characteristic Scottish modesty you have mistaken your capacity, which is, no doubt, equal to making—well, say lots of things. It grieved me sair when I read that WORK does not reach your ideal, which is doubtless high, but on proceeding I was, in some degree, consoled by seeing that you consider it of much value. It undoubtedly is, and the intention expressed is a laudable one, which, if carried out, will soon cause you to rank as an A 1 amateur. You are by no means too old to make progress in mechanical arts. Really, no, we do not give "snubs to those who dare to ask too much." It is a pleasure to help them in any way we can through "Shop," and no one need be afraid of asking questions when it comes within the scope of this magazine to answer. You must kindly make allowance, and remember that we cannot always evince the grace and general *suaviter in modo* peculiar to your countrymen. Glad to hear you preserve WORK. Please keep general business matters separate from remarks for "Shop."—D. A.

Xylophone.—MUSICUS.—The straw ropes are fixed on the top of the pieces of wood you saw, and are for the purpose of insulating the pieces of wood; they are generally on a sort of table, which may increase the tone. Fig. 1 is a plan view, and Fig. 2 a section, which I hope you will be able to make

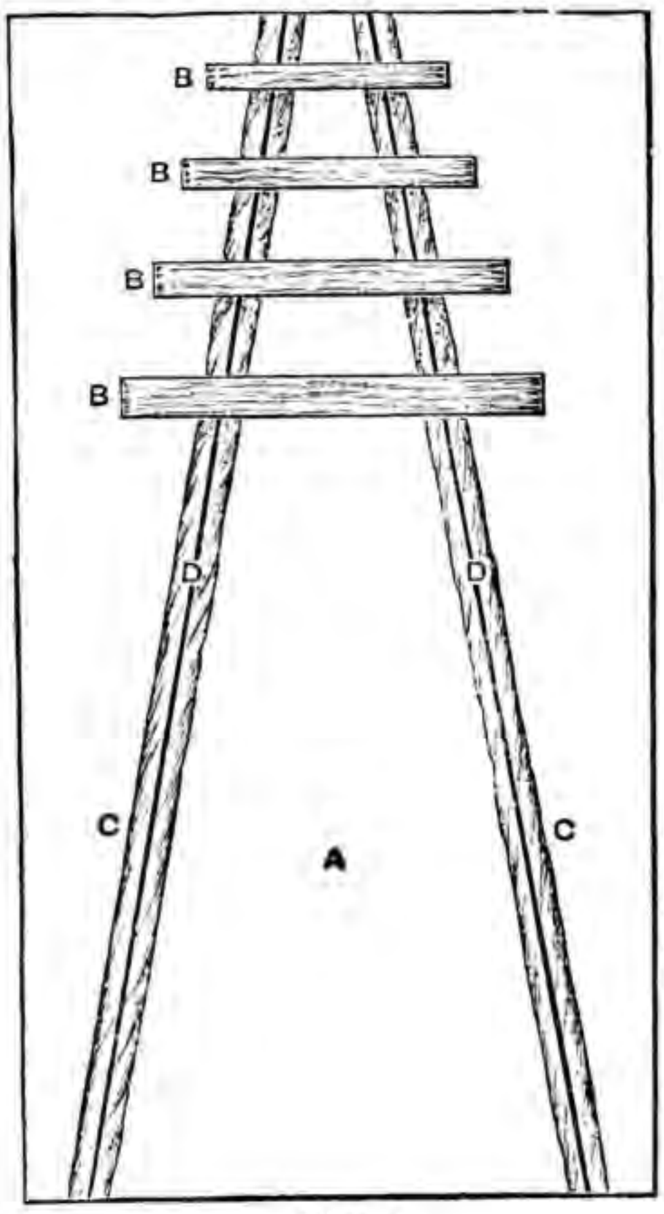


Fig. 1.

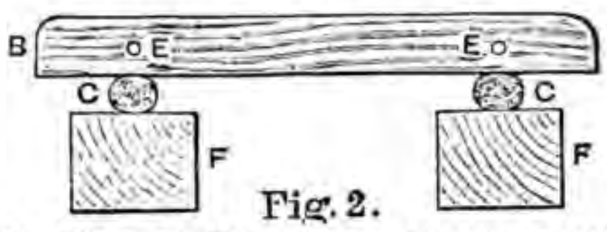


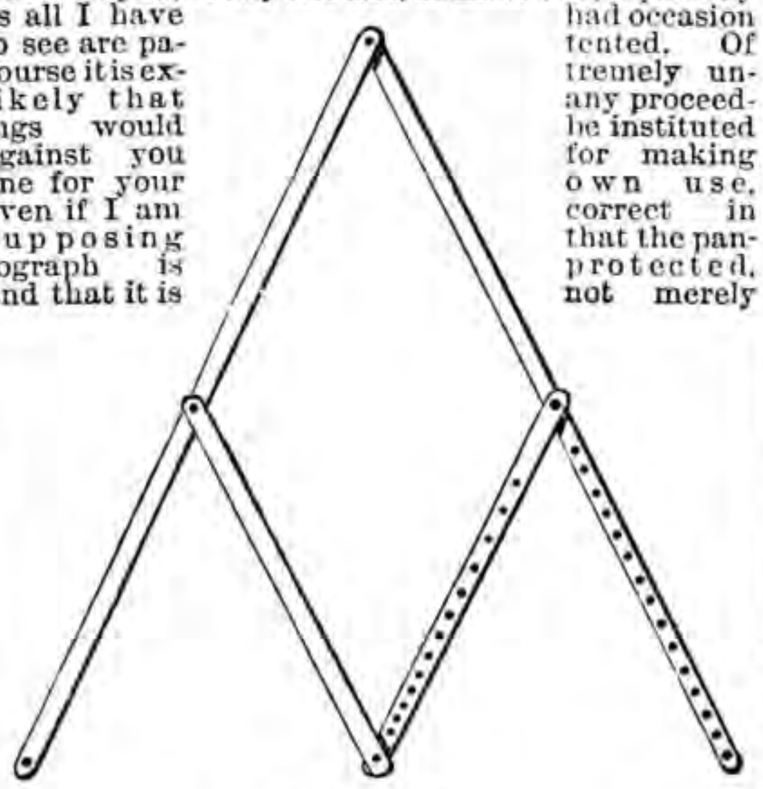
Fig. 2.

Fig. 1.—Plan of Xylophone. Fig. 2.—Section of Xylophone.

A, Table; B, Pieces of Wood; C, Straw Ropes; D, Cord through bars; E, Hole for cord; F, Strips of wood on which straw rope is sometimes placed.

out; you had better try to see one, when you could take any measurements. I have seen one of pitch pine hung by the cords alone, and played, but I think the tone is better when on the straw ropes. You can tune them by cutting the pieces shorter. Rosewood is said to be the best wood.—J. T.

Pantograph.—W. M. G. (*Hull*).—As a pantograph can be had for 6d., it hardly seems worth while for you, or any one else, to make one, especially as all I have had occasion to see are patented. Of course it is extremely unlikely that any proceedings would be instituted against you for making one for your own use, even if I am correct in supposing that the pantograph is protected, and that it is not merely



Pantograph.

improvements which are covered, but it is just as well in case of doubt that you should be warned of the existence of a possible infringement. In construction the pantograph is simplicity itself, or rather may be, for expensive fittings are by no means necessary, though often employed on the more costly forms. To go into the whole subject of panta- or panto-graphs here is out of the question, but having made one on the lines indicated here, you will have no difficulty in finding out how to apply it. I believe this form of it is not patented. Size must depend on kind of work intended, but my advice to you is to get a small one first. Four pieces of wood, two of which are, say, 1 foot long each, and two of half that length, will be required (see figure herewith). The stuff need not be thicker than ⅛ in., or wider than about ½ in. Fasten them, or rather, hinge them together, as shown in the diagram. Small screws, or even pieces of wire, will do for the purpose. At the ends you will require hole for pencil, fastening pin, and guiding point. For the pin you can use an ordinary carpet or drugget stud, and for the guiding point a small French nail. What you have to remember is to make the parts work freely and yet not shakily. By altering the position of the joint on one side you can alter the proportion of your copy. If you want exact work you will, however, do better by buying one ready made.—D. D.

Parlour Floor: How to Polish.—MAGISTER.—A paper on this subject will be given ere long, and if you will kindly wait till it appears you will gather more information from it than from any details which could be given within the limited space of these columns. With regard to articles of a more simple character being given in WORK, I need only remind you that experienced men must be catered for as well as beginners. No doubt these latter experience difficulties in making things, however plain and simple, but members of the staff are always pleased to assist through "Shop." If you look through the numbers which have appeared, you will see that a very large proportion of articles suitable for beginners have been given, the desire being to encourage novices and others to undertake healthy, wholesome recreation in mechanical pursuits, as well as to advance the skilled professional worker. Thanks for the interest you have taken by bringing WORK under the notice of your friends, and if those who find some of the articles "too technical" will just send along a note saying what they want to know, they will soon find what now seems too technical the natural language to express the work of the various handicrafts.—D. A.

Drawing.—A. J. T. (*Holborn*).—Apply to the secretary of any one of the following institutions:—The Birkbeck Institute, Chancery Lane, E.C.; the Polytechnic Institution, Regent Street, W.; West London School of Art, Great Portland Street, W.; Working Men's College, Great Ormond Street, W.C.—F. J. C.

Redressing Sandpapering Bands.—NO NAME.—Make a weak solution of glue, and spread upon your bands, then cover thickly with powdered glass. You will require two different sorts, one fine and the other coarse, although the coarse will work itself fine soon enough. You will be able to buy your powdered glass off any sandpaper manufacturer, whose name and address you will find at the back of one of their sheets. If, however, you wish to make it yourself, procure some thin broken window glass, and pound up with a piece of hard gritty stone, then sift through a fine wire sieve, and dust upon the wet glue before it sets as above mentioned. If the above is too much trouble I should advise you to cut sandpaper up in strips the required width, and glue on the bands, touch up the jointings with glue, and dust a little powdered glass over; use when thoroughly dry.—W. P.

Tube of Refracting Telescope—Driving Clock.—J. A. SINCLAIR (*Hammersmith*).—I have read your letter very carefully, and I do not quite see what telescope you are trying to make. But I can see that your acquaintance with the subject is very slight, and that you have a great deal of the simplest to learn before you can hope to understand "driving clocks." You must discard all idea of private inventions in the way of some apparatus on the object glass end of the telescope until you have succeeded in neatly mounting your telescope in the plainest possible manner. In trying to devise paper and tin tubes you will waste as much money and labour as would buy for you the necessary length of mandrel-drawn brass tubing, which is the proper thing to use. I can direct you how to mount your lens therein with no other aid than a file, a drill, a few brass screws, and a set square, so that your scarcity of tools need not make you despair. But there is not the least necessity for your main telescope tube to be cylindrical, though this fact seems always to escape the detection of folk unused to telescopes. You may employ your wood-spoiling capacities in the making of a neat piece of joinery in the form of a square-sectioned wooden tube of the required length of mahogany, which might be afterwards polished, or of plain deal. The term a "wood-spoiler" I use because you have used it, and not at all because I agree with you that it is synonymous with amateur. In this one private matter of astronomical telescope making, the art has ever been in the hands of amateurs. By-and-by, being amateurs in the truest sense—see the English Dictionary—they made their hobby and art their life-work, but that does not affect the question. Tell me whether you intend mounting your lens in metal or in wood, and then I will tell you how to proceed. Whatever merit for neatness your mechanical drawing may possess,

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your idea of a driving clock is so very crude that I cannot even undertake to tell you where it is wrong—it is wrong everywhere. The American clock you speak of would not do for you what you are presuming that it would do. Moreover, assuming for the moment that it had the necessary force, you have applied it to the wrong axis of the telescope. The very carelessness of you is shown by your question, "What do you think of the clock-work motion for the telescope? *not as anything at all accurate*" (the italics are mine). If the clock-work be not accurate it is absolutely, utterly, and entirely useless and absurd. That is what I think of it! Set to and learn somewhere the simplest theory of the refracting telescope, and then mount your lens humbly, and plainly, and neatly, and well. You will learn more of real art in one month by so doing, than you would be likely to learn in a year by trying to construct intricate apparatus. When you have made your telescope simply, and have used it awhile, you will discover that all intricate apparatus used in practical astronomy is used only in exceptional circumstances for exceptional purposes, and is never used when it can be dispensed with. WORK is always here to help and guide you, but as a true teacher and guide, it must ask you to do the simple work well before it may teach you the difficult work.—E. A. F.

Damaged Frames, How to Repair.—F. M. G. (*Stanningley*).—I am afraid you would find it laborious and expensive. What I should advise is to take your pictures out of the frames, and send frames to a maker to have them repaired and corner set on, or, if they are old-fashioned, chip off level and buy a set of compo corners. All that is necessary is to clean the corners, and place your new ones over steam for a few seconds—a cloth over a jug of boiling water—lay your corners on, take off, and place in position on frame. It does no harm to glue the part of frame first. Do not press corner too much, as you lose sharpness of pattern. Secondly, when corners are dry and hard, evenly spread with a camel-hair brush oil of gold size, let dry to tacky, then with a tip apply gold, using a cotton-wool dabber to press it on; then thoroughly dry off with clean cotton wool.—G. R.

Combination Couch and Bedstead.—COUCH BEDSTEAD.—Full particulars cannot be given in the limited space of "Shop," and this piece of furniture is hardly one that many readers would care to make, so that as there are so many subjects which are more popular, I fear a paper cannot be given, at any rate for some time. Of course, you can use any couch as a bedstead by making up the bed on it, but, I suppose, you want a thing which, in the day-time, will look like a couch, and when required as a bedstead can be increased in width. There have been several patent contrivances of this kind, but so far as I am aware none of them have met with anything like general acceptance. Such an article is less frequently met with than even the combination of cupboard and bedstead, a description of which is in the Editor's hands, and will appear shortly. My advice to you is not to waste time with a couch bedstead of the kind I suppose you want, but if you wish to try and make one, the hint that the seat frame, or rather an extra frame, is made to extend may be useful to you. Another way is to make the back so that it may be laid level with the seat when required.—D. A.

III.—QUESTIONS SUBMITTED TO CORRESPONDENTS.

Simple Incubator.—J. M. (*Glasgow*) writes:—"Would W. L. (*Kingsland*) (see page 557) kindly say at about what temperature the heat should be kept at in the box; and what kind of lamp may be used?"

Rivetting China.—A. JONES has not sent his address with his MS. and diagrams. Will he please do so?—ED.

Machinery for Making Surgical Plasters.—G. H. S. (*Manchester*) writes:—"Would any reader be kind enough to name a firm who makes a speciality of these machines, notably for producing the ordinary surgical sticking plaster—not court plaster?"

Flux for Welding Steel Spindles.—G. H. S. (*Manchester*) writes:—"Will any reader be kind enough to furnish a good flux, specially adapted for welding steel spindles of flax spinning machines? I have tried borax and sand, but they do not answer well."

Horse-shoeing.—A. R. (*Scorrier*) would like a practical paper or two on this subject.—[Will any competent writer volunteer to take the matter in hand?—ED.]

Waggon Brace Bits.—A. B. (*Northwich, Cheshire*) writes:—"Will you do me the kindness, in the way of letting me know the address of Mr. Leadbeater? He used to live in Spring Street, Birmingham, but he has a partner now. He is the maker of waggon brace bits. At present I have to walk about twelve miles to get the above bits, and when I get there sometimes the tradesman has none in."

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Complaint.—C. H. (*Bloomsbury*).—I do not insert your letter. J. H. knows perfectly well what he is about, and you are, or ought to be, aware of this.

Tin Ovals.—H. S. W. (*Wakefield*) writes in reply to A. N. (*Airdrie*) (see page 540):—"I purchased one of your papers called WORK, and while looking over the same found a reader asking for particulars regarding tin ovals, etc. If A. N. would write, giving particulars of tin ovals, etc., wanted to J. Rhodes and Sons, Grove Works, Wakefield, England, no doubt he would obtain the price and particulars wanted either to work by hand or by power."

Barnes' Foot-Power Saw.—A. M. (*Bethnal Green Road*) writes in reply to REMINGTON (see page 558):—"These are very good tools, and cut up to 2 in. I would suggest that you see one of the patent saws made by Britannia Company, 100, Houndsditch, and compare. These cut up to 4½ in."

Parchment.—W. H. (*London, E.C.*) writes in reply to DRENNAN (*Kilmarnock*):—"Vegetable parchment can be obtained of Henry Hymans, St. Bride Street, Ludgate Circus."

Small Pump.—H. A. B. (*Ashton-under-Lyne*) writes in reply to W. R. S. (*Brixton*) (see page 558):—"You will be able to get a set of pump castings from Theo. Tomlin, Model Engineer, Breeze Hill Terrace, Oldham. Having fitted up several model engines (both for pleasure and profit), I can recommend his castings as the best I can meet with, as regards the price and quality."

Machine for Making Cigarettes.—THOMASO writes in reply to S. B. R. (*Blackheath*) (see page 491):—"As I understand your question, you want a cigarette machine, something after the style of a coffee mill, one into which you can put tobacco and cigarette papers by the bucketful, turn a handle, and cigarettes fall out on the floor. That machine may be looked for about the time when that famous American sausage machine comes into the market, into one side of which live pigs were driven, reappearing on the other as pork sausages! The best way I know, and in fact one method adopted by manufacturers, where perfect uniformity in size is desired, is the following:—Roll the paper round a blacklead pencil, or anything of the desired size; gum down the edge and slide it off. You now want a piece of brass

Machine for Making Cigarettes.

tube about 6 inches long, made to open lengthwise on small hinges as in the figure. One end of this is to be tapered off gradually, and made small enough to just slip a little way into the end of the paper tube you have rolled. You open the brass tube, lay about twice as much tobacco in it as will be wanted (putting the fine in the middle); close it, insert small end into the paper; hold the paper on, and keep the tube shut with one hand, while with the other you push the tobacco out of the tube into the paper with a small stick. When you see the tobacco emerge from the end of the paper, cease holding it on the tube; continue to push with the stick, and the paper with the tobacco in it will drop off, only needing the application of the scissors at each end to leave it a perfectly formed cigarette. The tube is best made of sheet brass, and must be perfectly smooth inside; the two halves should fit well together. The small hinges sold for fretwork purposes will do, soldered on. The end of the tube can be tapered with the mallet on a piece of iron rod previously filed taper."

Gas Stove.—D. M. J. (*Portsmouth*) writes:—"If your correspondent, S. P. (*West Bromwich*) (see page 526) will communicate his address to me, I shall be pleased to send him sketches of stoves that might suit him, if he will kindly state if he has any chimney flue from his lecture room, as in any case it is advisable to carry the fumes of the gas out of the room. The local gas company may be pleased to give him all information."

Insurance of Tools.—A. X. E. (*Nottingham*) writes:—"In answer to J. K., page 366, No. 23 of WORK, and also T. T., page 429, No. 27, I may say that I insured my tools some few years ago with a most unsatisfactory result. I first insured with a company for £10 at a premium (annual) of 5s. In eighteen months the company wound up, or burst up, and transferred all business to company No. 2, annual premium 4s. 6d. In about eighteen months after, company No. 2 handed business over to company No. 3. I received a form to fill up signifying my consent to the transfer, or if on the contrary, I was to receive the amount of premium applicable to the unexpired portion of that year. However, I signed the form filled up duly and truly, and sent it to Mr. Secretary somewhere in London—I have forgot the address, and destroyed the papers as rubbish by now—but I never received a policy or anything else from that day to this. I once wrote asking for one, but received no reply, so now I invest my penny a week in WORK, and get my penn'orth, and a good one too! So, if J. K. and T. T. will take my advice about insurance, I say—Don't. Possibly something of the kind on the lines you suggest, in answer to T. T., page 429, might answer, but such is my experience of the companies I have dealt with."—[You may insure, I think, with perfect confidence in the "Hearts of Oak," which appears to be an old and well-established benefit society.—ED.]

Trade Notes and Memoranda.

A VERY good idea of the perfection to which the making of ships' chronometers has attained is gained by noting the performance of a chronometer which accompanied the ill-fated Polaris expedition which set out in 1871 on an Arctic expedition. When Captain Hall perished—some time in 1872—the chronometer was abandoned, and lay buried in the snow for four winters, when it was found by some members of an English expedition, dug out and wound up, when it started up as usual, losing at a uniform rate of about one second per day. It had been subjected to temperatures ranging as low as 100° below zero. The chronometer was made in America, and has been sent from the British Admiralty Office as a present to this country, being now in possession of the Navy Department.—*American Machinist.*

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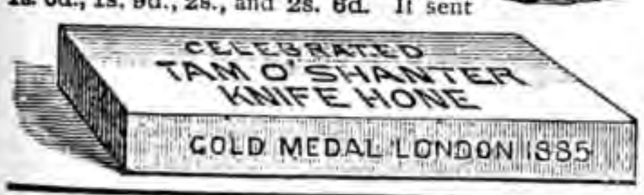

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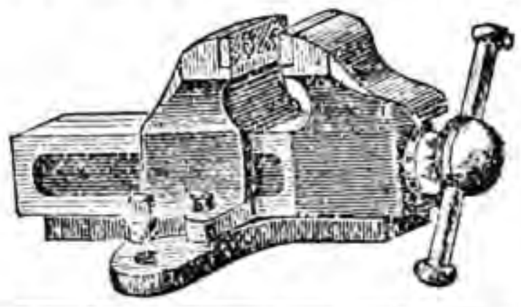

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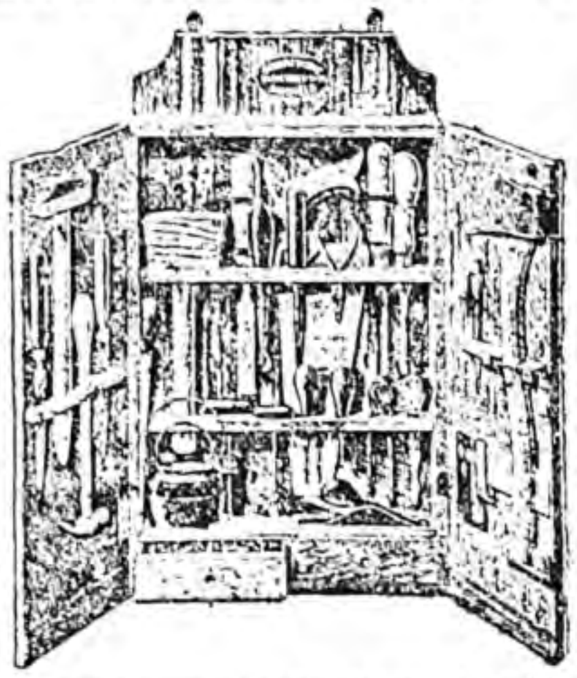

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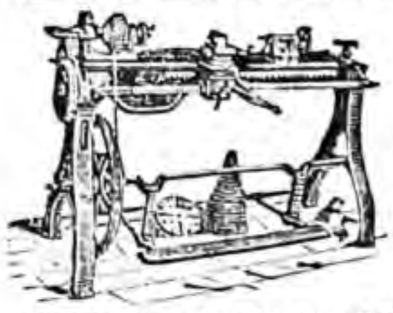

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